THE
ELECTRICAL REVIEW.

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ELECTRICAL REVIEW.

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THE CITY LIGHTING.

THE public lighting of the City of London has for decades been the subject of controversy, and seems destined to remain in that category for some time longer, if we may judge by the report of the deputation to the Continent, which has just been issued. This deputation consisted of five members of the City Corporation, who, unprovided with expert advice and assistance, fared forth to investigate the systems of public lighting in vogue in some of the chief Continental cities. They visited Brussels, Cologne, Düsseldorf, Dresden, Vienna, Munich and Paris, and found that *not one* of these cities had adopted high-pressure incandescent gas lighting in any form, and only two of them were even experimenting with it. Yet they came back with the recommendation that high-pressure incandescent gas lamps with inverted burners should be adopted by the City of London, apparently because Berlin alone, which uses a number (not stated) of lamps of this type, has decided to adopt the system throughout the principal streets!

The first, and presumably the principal, recommendation of the deputation is that, wherever possible, the streets should be lighted by means of centrally-hung lamps with lowering gear, because the number of obstructions upon the footway is already so large. We might point out that the lamp-trimmers at present go up the arc lamp-posts and cause no obstruction whatever. As for the centrally-hung lamps in Cannon Street, they are trimmed in position with the aid of portable ladders, in the early hours of the morning, when there is very little traffic; there would be no less obstruction if lowering gear were used—rather more, indeed, if the operation of trimming was not then restricted to the small hours as at present. Open spaces, says the report, should be lighted with lamps on standards, fitted with lowering gear.

Our readers are now in a position to realise the full beauty of the recommendations of this well-meaning but absolutely inexpert party of inspectors of public lighting. The report, briefly summarised up to this point, recommends that high-pressure inverted incandescent gas lamps shall be used, *centrally-hung wherever possible, and provided with lowering gear*. Who ever saw, or even heard of, such a system? Not only does the deputation recommend a lamp that is found in only one of eight great cities on the Continent, but it advises the adoption of a combination of lamp and suspension that it has never seen at all!

It is after digesting the foregoing propositions that we arrive at what proves to be the redeeming feature of the report—the concluding recommendation: "Where gas is impracticable, electricity with open arc and flame arc lamps should be installed." Seeing that high-pressure gas lamps with lowering gear are quite out of the question as regards practicability, the ultimate effect of the report, it seems, is simply this:—Arc lamps shall be used, centrally-hung where possible, otherwise on standards, and equipped with lowering gear.

How far is this conclusion justified by Continental practice?—If we examine the report, we find that *in every instance* the deputation finds that the important streets are lit with electric arc lamps. There is no escape from it—no exception; electric arc lamps are the first illuminants to be mentioned in each of the eight cases. In some instances electric glow lamps are used also; gas invariably is mentioned last.

As regards the expression "open arc and flame arc lamps," this in itself indicates the inexperience of the deputation; no one who knows anything about the subject would think of installing open arcs for public lighting nowadays.

Why does Berlin alone propose to use incandescent gas lighting throughout? If we look into the details, we soon find the reason: the municipality supplies gas from its own works charging 1s. 4½d. per 1,000 (said to be cost price) for public lighting, and no less than 3s. 6d. to private consumers; electricity is supplied by a company—cost not stated. In London, gas for public lighting is supplied at 2s. 4d. per 1,000.

Another significant feature—one to which we are accustomed in connection with this question—is this: while, in the case of arc lighting, the illumination *as measured* near the ground level is generally stated, in the case of gas lighting we are given only the *estimated* candle-power of the lamps themselves. The numerous data given, therefore, are absolutely useless for the purpose of comparison—the essential feature is missing. Further, in Berlin, where high-pressure gas lamps are used, the height to burner ranges from 14·7 to 18·7 ft. It is hardly necessary to point out that centrally suspended lamps would have to be placed 10 ft. higher, and the polar distribution C.P. curve of the inverted gas mantle is such that, at this height, it would be quite useless for illuminating the roadway—assuming, of course, that centrally-hung high-pressure inverted incandescent gas lamps with lowering gear had any existence other than in the imagination of the deputies.

The latter apparently felt a lurking suspicion that there was something wrong; for they suggest that before any drastic alterations are made, further experimental lighting be carried out. The parties concerned must be getting rather tired of these interminable experiments, but after all there is no better course, provided that the experiments are carried out with scrupulous fairness and under expert advice, with a single-minded desire to select the most economical and efficient system of illumination. It is to be hoped that in conducting such trials, the authorities will not fail to take into consideration the new situation created by the development of the metallic-filament lamp, which has been practically ignored in the report, but nevertheless bids fair to provide an ideal solution to the problem of lighting the less important streets.

CHEAP POWER.

It is rapidly being realised that the provision of cheap power is vital to the industrial prosperity of this country. It is only necessary to quote as evidence of this the Presidential Address to the Municipal Electrical Association a week or two ago, the paper read on the subject at the same Convention by the chairman of a Municipal Electricity Supply Committee, and the proceedings at the Local Government Board inquiry into the application by the West Ham Corporation for leave to borrow a large sum for extensions to their electricity supply undertaking. In each case the standpoint from which the subject was approached was different, but the final question reached was the same—viz., to what extent must the large power user contribute towards the capital charges of the whole undertaking? In the majority of the municipal undertakings of the country, the question may be paraphrased as an inquiry as to the number of generations to which "the sins of the fathers shall be visited upon the children."

To illustrate our meaning West Ham will serve as an example, though others might equally well be cited. Ten years ago a supply for public and private lighting in certain parts of the borough was started, and was moderately successful. A tramway load was added, which helped to improve matters, but even then in some years the sinking-fund charges had to be partly provided out of the rates.

A part of the borough untouched by the private lighting supply presented great possibilities for industrial development, if really cheap power were available. The Corporation a few years ago adopted a spirited policy, built a new station, installed new and suitable plant, laid special mains, and took such steps to push their power supply business, that last year over 5½ million units were supplied to that district alone, at an average price of less than one halfpenny per unit.

In order to reduce the working costs of the undertaking, the original generating station has been abandoned, and the generation of energy for all purposes has been concentrated at the new station. The present buildings will suffice for large extensions of plant. This means that the total capital outlay on the undertaking with its disused generating station and extensive network of lighting mains is high, but that extensions of plant as well as of the mains necessary for the supply of large power consumers can be carried out for a relatively very small sum.

The question argued before the inspector at the inquiry, and now under the consideration of the Local Government Board, is whether the Council were justified in the course they took—that is, to consider what portion of the total capital outlay was directly concerned with the supply to any particular class of customers, and only charge to them the annual capital charges required to meet that part of the capital cost—or whether the capital charges for the year should be divided *pro rata* among all the units sold in the same period, irrespective of the use to which they were put.

It was pointed out, as justifying the action of the Council, that had the latter course been adopted, not one power customer would have been secured. The "sins of the fathers"—represented by their enterprise in embarking in the business of electricity supply before finality had been reached in the design and methods of working of an electricity undertaking—would have prevented any present development or future prospect of power supply. This would have been done, too, at the expense of the lighting part of the undertaking, for the diminished output for this purpose during the past year, due to the use of the new wire lamps, would have necessitated a rise in the price charged per unit.

As a result of the policy adopted, this has been avoided; the average price obtained for private lighting has been brought down from 3·66d. in the year the power supply was commenced, to 2·72d. last year, and the average price of all the power units sold has been ·591d., one specially long-hour consumer getting his supply at ·37d.

Cheap power is having its inevitable result; new industries are being attracted to the neighbourhood, and older ones are extending their operations. This means increased rating value and, more important still, more employment for the inhabitants. There are signs that soon the undertaking will be able to bear, as a whole, its full share of capital responsibilities, and that thus the policy of treating the power supply as a new business, to be considered on its own merits, rather than as an adjunct of the lighting supply, will be fully justified.

What has been done by a municipality at West Ham and a company on Tyneside may be done—and, fortunately, has been done in some cases—elsewhere. The application of this principle needs caution, but, judiciously applied, it may bring increased prosperity to many undertakings without inflicting any disadvantage or injustice on the present consumers.

TEMPORARY REPAIRS TO STEAM SETS.

The functions of the maintenance engineer of a power house do not only include the economical running of the plant and the upkeep of the same in an efficient condition, although this is the larger proportion of his work, and the part for which he is mainly paid. It may be taken that the better the maintenance of the plant the less sensational, as a rule, are the experiences of the engineer in charge of the same, and it is therefore best to keep a good and experienced maintenance engineer upon the staff at a respectable salary, in preference to economising wages and trusting to Providence. At the same time, however, accidents may happen even in the best regulated power house, and it is at these times that the ingenuity and resourcefulness of the maintenance engineer provide a further test as to his worth. It is a first principle in power-house practice that the plant which is available shall be kept running at all costs in order to avoid a breakdown to the supply of electricity, and this rule receives special emphasis nowadays, when such binding contracts as to reliability and continuity of supply are made in connection with the distribution of electric power.

It may therefore be interesting to give one or two notes regarding breakdowns of power-house plant and the way in which they were overcome in a temporary manner, so as to enable the supply to be resumed with a minimum of interruption. It is not, of course, suggested that these repairs are anything like standard practice, or that the efficiency of a temporary job to meet the conditions of the moment should be a pretext for its becoming a permanent repair. The possession of ingenuity and resourcefulness, however, in overcoming difficulties is of very great value, and it is possible that the following notes may bring forward further instances of rapid repair work which may be of use to engineers in power houses.

As an instance of a temporary repair may be taken a fairly common accident—that of a broken gland in a stuffing box (fig. 1). It is very seldom that the centre-piece is broken away, the fracture usually occurring at the side of the flange, generally at the point where the bolt or stud

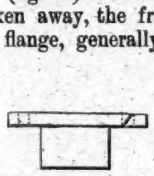


Fig. 1.

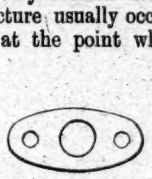


Fig. 2.

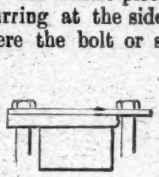


Fig. 3.

passes through the flange. Its usual cause is from the fact that the packing in the stuffing-box is too hard, or else that the gland has been screwed too tight or screwed up unevenly between the two sides. If the gland in question is one which can be got off without unshipping a large proportion of the engine, the simplest way to effect a repair is to cut a strong steel plate to the shape of the gland flange (fig. 2), mark off upon it the position of the bolt-holes on the flange, and drill these out. This can be placed on the top of the broken gland, as shown in fig. 3, and in order to make up for clearance, if this is necessary, one turn of the packing can be taken out of the stuffing box. In the case of a gland such as that, for example, of a piston-rod, that cannot be taken off without a considerable amount of trouble, two of the holes in the plate should be modified into the form of slots, as shown in the fourth figure, the whole blade being thus somewhat of the shape of a horseshoe. By taking the nut completely off one stud or bolt, the blade can be slipped on this stud, which is therefore used as a pivot, and the blade is then swung into place and secured by means of the nut on the other bolt, which has previously been slackened back. It is found that this repair gets over the difficulty in a very quick and satisfactory manner.

It occasionally happens that trouble is experienced with the air pump, due to the fact that the brass guard for the valves comes adrift because the split pin securing the nut is not in place. This may occur through this pin either breaking or working out; the nut then becomes slack, and if not found in time it works off, leaving the guard loose. As a rule, there is sufficient clearance in the pump to allow for this so long as the guard lies flat, but it is possible in one stroke for it to rise on its edge. The result of the occurrence will probably be that the cover of the pump will be broken into four or five pieces, although it is not likely that the stuffing box will be damaged.

In a case of this kind, the repairs were carried out in the following manner:—A good strong stokehold plate, made of cast-steel, was taken, and the broken cover was laid on this and pieced together in the manner shown in fig. 5. The holes in the cover were then marked off on the plate and drilled, and a centre hole was cut in the plate to fit the spigot of the stuffing box. This stuffing box was thus bolted on to the plate accurately centrally, and the temporary cover thus formed (fig. 6) was fitted on to the air pump, the small pieces of cover being thrown aside. It was found that this

Fig. 4.

Fig. 5.

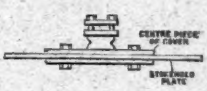


Fig. 6.

enabled the set to be got away again and worked satisfactorily until there was time to order another cover from the makers.

An accident which, fortunately, does not occur very frequently in power-house work, but which is occasionally to be met with, is the breaking of a cylinder cover, due to one of the piston nuts working slack and fouling the cover. This kind of accident is at its worst when it occurs on the high-pressure line of the engine, and the way in which this trouble was temporarily got over may be of interest. A strong plate, which, as a matter of fact, was a stokehold plate, was taken and holes were marked off on it, and drilled to suit the studs on the cylinder flange. This in itself would have been sufficient, when properly jointed, to have served for a low-pressure cylinder cover, or even a medium-pressure cylinder cover, but, in order to strengthen it sufficiently to allow the high-pressure steam to be taken, it was suggested that strong iron bars should be bolted across the cover from stud to stud, as shown in fig. 7. Unfortunately, at the time, these bars were not available, and the somewhat risky expedient of

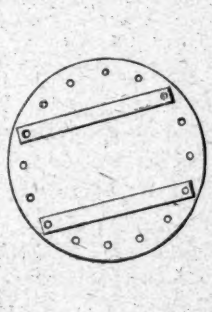


Fig. 7.

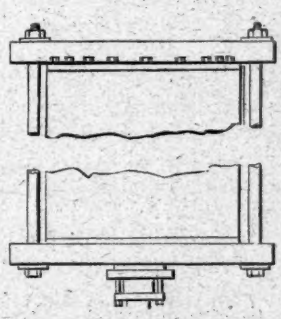


Fig. 8.

using wood was adopted. Heavy timber baulks were obtained and laid across the top of the cover, as shown in the sketch, fig. 8, and these were secured with long bolts and wide washers to similar baulks on the underside of the cylinder. The baulks were protected from the action of the heat by interposing two thicknesses of asbestos sheet, and although the set was started up in fear and trembling, it managed to perform its work until the necessity of running the engine could be avoided.

The above examples typify the class of trouble which a maintenance engineer is sometimes called upon to negotiate, and it may be that a considerable number of similar examples can be called to mind by engineers engaged in this class of work.

THE I.M.E.A. CONVENTION.

Notes on Condensing and Water-Cooling Plants.

THE above title very well describes the nature of the paper submitted in competition for the I.M.E.A. Travelling Studentship, 1909, by Mr. E. Lunn, of Huddersfield, who was the only competitor, and was, of course, successful.

There is nothing very striking in this paper, but it is one of a sort that it is well to have from time to time, for it brings under review the different varieties of plant that may be employed on the condensing side of a steam station, and should be of real assistance to the engineer who has condensation in mind. A saving of 20 per cent. may be made by the adoption of suitable condensing plant, and on the face of it there appears no question as to the desirability of effecting this saving. But it is necessary to be very careful in drawing up an estimate of the saving to be expected. To begin with, the size of the plant and its cost must be known.

It may be assumed at first that the plant should be big enough to deal with the maximum load. Then it will cost so much. Next, what is the load-factor of the plant, and what are the working hours?

Suppose that the load-factor is 12½ per cent., and the conditions are that a plant of 100-H.P. capacity is put to the duty of saving 20 per cent. on the steam output of an average load of 12½ per cent. This is the saving to be made, and as a set-off against the saving, there is the interest on capital, depreciation and maintenance of plant, and the cost of steam to drive the air pump.

An engineer faced with such a case will probably decide that he will be content with a poor vacuum during the period of peak load, for otherwise his condensing plant will cost him too much, and will absorb a lot of steam during low loads when working so much below its capacity. It may, therefore, be an economy to install condensing plant much smaller than will give a good vacuum on the peak load, and yet will save fuel all the rest of the day without being too costly to begin with.

The author sums up well in stating that the saving ought to be more than 10 per cent. on the cost of the plant, for it will cost this in interest, repairs, &c.

When the engines are already taxed to their limit, condensing plant may well be laid down to add 20 per cent. to their power, and in a case of this sort it becomes necessary to consider the cost of an additional engine as compared with the cost of the condensing plant. The advisability of installing an exhaust steam turbine ought also to be considered.

But ordinarily, unless the load factor exceeds 10 per cent. with cheap condensing water, or 13 per cent. when cooling towers are used, it will not pay to condense.

Attention is drawn to the increased cost for higher vacua; this is a point deserving of special attention when cooling towers and lifting pumps are employed. The various types of condenser are briefly stated and their salient features noted.

The author has found that the 400 ft. per minute of air-pump bucket speed is usually too high, and has found better results when the speed of an 18-in. × 18-in. pump designed for 350 ft. per minute was reduced to 300, and even to 250 ft. Hustling air pumps are probably a mistake; they seem to have come into being as a bit of the general high-speed hustle of generating stations; and the cases have not been few where a vacuum, poor because of air leakages that might be avoided, has been brought up to normal by over-running the air pumps—a proceeding not unlike that of the man who lifts himself by his own boot straps.

It is noted that steam-driven pumps call for 50 to 100 per cent. more steam than electrically-driven pumps, though this is often largely counteracted by the use of the pump exhaust for feed heating, a plan far preferable to sending the steam to the main condenser. But there is usually so much waste heat available for feed heating, that it is not always easy to see how to use it.

At page 60 we suppose the depth of the circulating trough is 7 in.—not 7 ft. There troughs are stated by the author to be very inefficient coolers, presumably because they surround themselves with a saturated atmosphere, and evaporation then ceases. Water-cooling plants may now be had wherein the wooden laths are self-locking in position, and the depreciation is much less than when nails are used.

Perhaps, to-day, condensing has been carried somewhat to extremes. A few years ago the reverse was the case, and many plants were run on the atmosphere which ought to have had the benefit of condensing plant and were well situated in respect of water. But much less has been obtained from condensation by reason of inattention to details than ought to have been. Condensation is a means of getting rid of the atmospheric resistance. Why, then, has there been so very much carelessness in letting that objectionable atmosphere leak into cylinders, boilers, pipes, by way of direct leaks or through the feed water?

These points might perhaps have been more emphasised in the paper before us.

Modern Cable Systems.

By E. M. HOLLINGSWORTH, Chief Electrical Engineer, St. Helens.

(*Abstract.*)

FOR overhead transmission lines aluminium has been used for many years with satisfactory results, but until quite recently it had not been tried for the conductors of insulated cables. Compared with copper conductors of equal conductivity, aluminium conductors are 50 per cent. lighter in weight, and 28 per cent. greater in diameter. Beyond a probable saving in carriage the reduced weight does not affect the question of insulated cables, with copper and aluminium at present prices. In the matter of increased diameter the advantage of a greater cooling surface is obtained, but against this extra insulating and sheathing materials, and troughs or conduits of larger size are required.

With copper at £60 per ton and aluminium at £65 per ton, there is an advantage in favour of the latter for single-core cables above the equivalent of ·05 sq. in. of copper. Taking cables having the equivalent of ·1 sq. in., ·2 sq. in. and 1 sq. in. copper conductors, there is a saving of 15, 20 and 30 per cent. respectively. In the case of triple-concentric and three-core cables the difference is not so great.

For underground work, rubber-insulated cables have almost entirely dropped out of use; for medium-pressure systems vulcanised-bitumen cables are used.

Compared with paper insulation, vulcanised bitumen claims the advantage of being absolutely non-hygroscopic, thereby obviating the necessity for lead sheathing, but although moisture that is neutral, or acid, has little or no action, moisture that is at all alkaline will attack this cable, and under certain conditions rapid deterioration takes place, the material becoming a spongy mass and, of course, no longer waterproof. It is certainly the best plan to lay vulcanised-bitumen cables underground on the solid system, to prevent as far as possible contact with deleterious matter.

These cables are very extensively used in collieries, where the conditions generally are damp, and where in the case of the pit shaft the question of weight is an important factor, for a single-core vulcanised-bitumen cable of ·1 sq. in. section is only half the weight of the equivalent paper-insulated lead-covered cable.

For all systems and pressures, paper insulation is used, as it possesses the advantages of high dielectric strength, greater durability and low electrostatic capacity. It is strong, does not soften under heat, and is not liable to crack, and cables so insulated can be safely worked at a greater current density.

The chief drawback to this class of insulation is its susceptibility to moisture, which necessitates the use of lead or other sheathing to render it waterproof.

There is a danger of electrolytic corrosion, particularly where the cables are laid in the neighbourhood of a tramway system, but if the precaution is taken of solidly bonding the lead sheaths and connecting them at suitable points to earth plates, the risk is reduced to a minimum. Good sturdy bonds of lead strip are far superior to copper wire. It is advisable to keep a record of all the earth plates, and they should be tested frequently.

Leadless sheathing has a great advantage as far as prevention of electrolysis is concerned, but such cable is not mechanically as strong as that with lead sheathing, and in certain localities there is risk of chemical action.

The direct system finds favour where the initial outlay is a consideration, and for cables placed where there is little danger of mechanical injury, and where the soil is of a sandy nature and free from acids and organic matter, this system is very suitable.

With few exceptions, all the cables laid direct are armoured with steel tape or galvanised iron wires, and are usually paper-insulated lead-covered, with a substantial jute covering between the steel armouring and the lead sheathing, and also over the steel armouring.

Although comparatively little of this cable is in use at St. Helens, it has given more trouble than all the rest of the network. For one reason the soil, being impregnated with acids, quickly rotted away the jute covering, and in places the armouring entirely disappeared. In nearly every case the faults occurred in single-core cables, the triple-concentric cables giving little or no trouble.

On account of the thickness of the layers of jute and the dimensions of the armouring being now fixed by the Engineering

Standards Committee, and the cable manufacturers taking greater care with respect to the quality of the materials and their application, this class of cable is being more generally adopted for all systems of supply.

The solid system is very little more expensive and is almost as flexible as regards laying as the direct system, and cables laid in this way are better protected from external influences than when laid in any other way.

Stoneware troughs appear to have superseded to a great extent those of wood or iron; they are as cheap as wood, considerably cheaper than iron, more durable, and if properly glazed inside and outside, proof against chemical action. They have, however, the disadvantage of being only about 2 ft. long, which means an increase in the number of joints in a given length. Butt-jointed troughs should not be used. The author has experienced considerable trouble with certain lengths of cable through moisture getting in at the joints, owing to the careless laying of the troughs.

For bitumen cables, bitumen filling is used, but very little bitumen is now used with lead-covered cables, good pitch reduced by a suitable oil being found satisfactory and very much cheaper. Pitch has also the advantage of a lower melting point than bitumen and does not require the same care in filling, and in the case of a fracture there is a better chance of its healing again.

The minimum thickness of filling should not be less than ½ in., and to ensure an even thickness the bridge pieces should be placed at suitable intervals, usually 18 in. apart, but never exceeding 2 ft., depending upon the size and weight of the cable.

When cables are laid through a busy thoroughfare, or where a great many of them are banked together, the system in which they are drawn into conduits or pipes is the only one suitable.

Cast-iron, fibre and glazed stoneware conduits are in most common use; a good method is to build up in concrete with single ducts the number of ways required, care being taken to prevent the cement at the joints from entering the ducts. This type, provided not less than nine ways are installed, represents the cheapest form of conduit.

The author thinks that subways are likely to be more generally adopted in the future. There is in St. Helens, down the two principal thoroughfares, a subway, 6 ft. 6 in. high and 5 ft. 6 in. wide, nearly half a mile in length, with an entrance at each end and one midway, and with lateral ways at the inter-sections of the other streets. With the exception of a 4½-in. ring of blue bricks forming the inner arch it is constructed entirely of concrete; the form of construction and arrangements of the gas and water mains and electric cables are as shown by fig. 1.

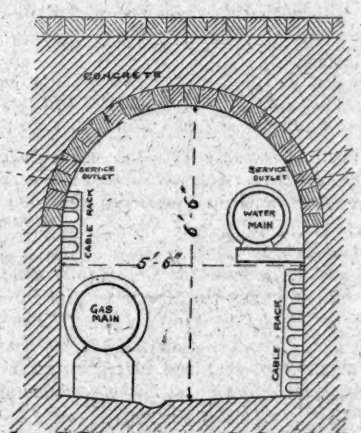


FIG. 1.—CROSS-SECTION OF SUBWAY.

For the gas, water and electric service connections, 6-in. earthenware pipes are laid at frequent intervals.

The work was completed in 1899; the cost including the lateral ways was £7 per lineal yard, and the electricity department's share of the capital and maintenance charges is £90 per annum.

At the present time, exclusive of service connections, it contains 4 miles of cables ranging from ·1 to 1 sq. in. single and multi-core. The average cost, including the racks and the placing of the cables, is about 1½d. per yard of cable. About 100 consumers are supplied through services connected to the mains of the subway. Large three-wire consumers are in each case connected direct, but in the case of small consumers three or four are supplied from one set of service cables.

Before concluding, the author refers to the value of overhead conductors for supplying isolated districts, and gives a brief description of the system that has been in use in connection with the St. Helens Corporation scheme since 1902.

By means of overhead conductors a supply of energy at 500 volts D.C., with one side earthed, is given to several glass works and collieries situated within a radius of two miles from the power station, but separated by rough ground impregnated in places with chemical waste. For this reason, it was quite out of the question to lay cables underground, and the Board of Trade, being convinced of this, consented to the conductors being placed overhead.

The total length of the pole line is just over 1½ miles, and the poles are placed about 40 yd. apart. The dimensions of the poles and cross arms and the arrangement of insulators and conductors are shown by fig. 2.

The poles are of red fir, well creosoted, and are to the specification issued by the General Post Office in connection with the supply of telegraph poles. They are planted to a depth of 8 ft. with a packing of concrete, and about every two years the base of each pole is exposed to a depth of about 2 ft. and coated with oil of creosote. Apparently so far there is little or no deterioration, which undoubtedly is due to the process of creosoting these poles, for, by some misunderstanding, one or two poles that had not been

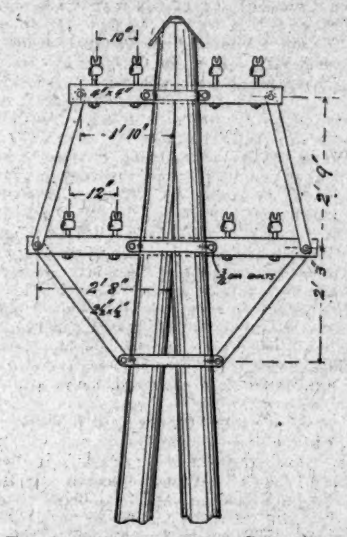


FIG. 2.—ARRANGEMENT OF CROSS-ARMS.

treated were erected, but after six years' use they had to be replaced. The cross-arms are of creosoted oak with stays of wrought-iron, and the insulators are the Post Office heavy telegraph type.

The conductors are 0000 S.W.G. solid drawn copper, staggered in order to comply with the Board of Trade Regulations. Three pairs of conductors are in use for a portion of the distance, and there is room for another pair.

DISTRIBUTION AND SERVICE CABLES—COST PER MILE.

Area of each conductor, sq. in.	Type and number of cables.	Cost of cable only.		Total inclusive cost.		
		Plain lead covered.	Armoured.	Armoured cable laid direct.	Lead-cov. laid solid in s.w. troughs with pitch filling.	Drawn into 3-in. s.w. ducts inc. draw-in boxes.
		£	£	£	£	£
·007	Twin	83	133	159	197	275
	Conc.	72	121	147	186	264
·0229	Two	128	221	258	271	508
	Twin	129	185	214	247	320
	Conc.	123	176	205	241	314
(*a*) ·035	Two	162	256	293	305	543
	Twin	170	230	259	288	362
	Conc.	165	223	252	283	358
	Three	229	369	420	402	761
	3-core	236	307	344	376	434
	3-conc.	237	314	351	377	435
(*b*) ·1	Two	342	454	494	507	731
	Twin	353	432	465	489	551
	Conc.	335	412	445	471	533
	Three	462	624	683	664	1,009
	3-core	468	558	602	630	673
	3-conc.	460	555	599	622	665
(*c*) ·25	Two	714	865	913	905	1,111
	Twin	706	816	853	860	910
	Conc.	692	796	833	846	896
	Three	885	1,092	1,158	1,116	1,443
	3-core	950	1,075	1,126	1,134	1,163
	3-conc.	975	1,105	1,156	1,159	1,188
(*d*) ·5	Two	1,329	1,524	1,579	1,549	1,737
	Twin	1,312	1,450	1,490	1,485	1,525
	Conc.	1,274	1,406	1,446	1,447	1,487
	Three	1,623	1,889	1,966	1,887	1,295
	3-core	1,659	1,829	1,886	1,868	1,879
	3-conc.	1,672	1,845	1,902	1,881	1,892

NOTE.—Electrolytic copper bars taken at £70 per ton and lead at £15 per ton. The cost of disconnecting boxes and trenchwork is not included. All cables are taken as being paper-insulated, lead-covered; there is very little difference in cost between such cables and bitumen. In case of three singles, three-core and triple cables, the neutral conductor is taken as: ·025 sq. in. for (*a*), ·05 sq. in. for (*b*), ·10 sq. in. for (*c*), ·20 sq. in. for (*d*).

The cost of the work, exclusive of the conductors, was £220 per mile, and for each pair of conductors erected must be added £170 per mile. If copper conductors were replaced by aluminium at present prices, the cost would be for each pair of conductors £120 per mile. For comparison the cost for the equivalent underground

mains, that is, two ·15 sq. in. cables, laid solid in earthenware troughs, would be £800 per mile.

From these figures it will be seen that the installation of overhead conductors is considerably less expensive than in the case of underground cables, and, in addition, the cost of maintenance is less, and such a system offers more flexibility and less risk of breakdown.

DISCUSSION.

In opening the discussion, MR. W. W. LACKIE (Glasgow) said that he favoured the earthing of the metallic sheathed cables at a limited number of points, so that it was easy to disconnect for testing, &c. He did not agree with the use of metal sheathed L.T. cables, preferring V.B. cables; in Glasgow the solid system was used, and the standard practice was to run a feeder to a disconnecting box which supplied its own section of the network, the sections being independent of each other. This also facilitated testing and load measurement, &c.

MR. S. J. WATSON (Bury) commented on the importance of the subject as 30 out of the 80 millions invested in electrical undertakings, is invested in mains, &c. There was still no standard practice in mains laying, and it was broadly a question of "laying solid" or "drawing-in." To him it was difficult to understand anyone using an inaccessible solid system, when one considered the modern tendencies of engineering design. He agreed with the previous speaker that V.B. cable was superior to lead-covered; he found it quite satisfactory except in draw-in systems near urinals, &c., and in such a situation he had known the bitumen to be dissolved owing to a leaky drain. But V.B. cables were not liable to give such serious shocks or leaks, even if damaged, as other types of cable. He considered that overhead mains did not get the attention they deserved, when one considered that their cost was 1s. to 2s. per yard, as against 6s. per yard underground; and that bare instead of insulated copper was used.

MR. F. A. NEWINGTON (Edinburgh) said lead-covered paper-insulated cable on the drawn-in system suited the Edinburgh conditions, saving a good deal of expense in breaking concrete pavements, &c. Bitumen cable he had found unreliable, as also the old rubber cables. He disagreed with some of the author's tabulated costs; he had found less difference in cost than the author between the draw-in and solid systems.

MR. W. A. VIGNOLES (Grimsby) said the author had not referred to the boxes, which gave most trouble in a cable system. He was using a special cast-iron box, with the lead of the cable wiped on to the box, and this provided a water-tight connection. He thought triple-concentric cable was most satisfactory, but the jointing was an expensive matter. For side streets he was using three-core ·02 cable; this was small owing to the small property and demand. From tests made in Grimsby he found the average current per house to be about 2 amperes, and in the case of small houses, it was, of course, less.

MR. F. AYTON (Ipswich) said, in reference to small services for street lamps, he was using lead-covered rubber-insulated cable, with bitumen-filled fuse boxes in the base of the lamp. He was using some overhead mains, and had a span of 350 ft. across the river in use; he had had no trouble whatever with the overhead mains, and wished he could make more use of them.

MR. J. E. EDGCOME (Kingston-on-Thames) defended the armoured insulated cable laid direct, from his experience of some 16 years. He had recently opened up some lengths of cable and found them in an excellent condition, except in the case of a few yards near a leaky gas main, which latter had caused corrosion. It was a very flexible system and cheap; the L.G.B. seemed to think that it would not last quite so long as the solid system, but they eventually agreed to allow the same loan period as for that system.

MR. C. C. ATCHISON (Rochdale) said he had used armoured lead-covered paper cables since the start, and had had no cause to repent it. He was glad to hear that overhead mains were being used as distributors, as he had found them useful. If aluminium were used instead of copper for this purpose, the extra size and wind pressure would have to be taken into account.

MR. S. E. FEDDEN (Sheffield) said that bitumen cables laid solid had proved absolutely reliable during his 16 years' use of them. He was not a believer in joint boxes on mains, where they could be avoided. He had some 230 miles of lead-covered cable, and had not had a fault in eight years. This class of cable should be run in iron pipes rather than concrete ducts. It was no use trying to keep a conduit dry, and not necessary if suitable cable were used.

Owing to the shortness of time, MR. HOLLINGSWORTH decided to communicate his reply.

Modern Cable Systems.

In some introductory remarks at the beginning of his paper on "Modern Cable Systems," Mr. Hollingsworth emphasises the importance of his subject by pointing out that the cable network is that part of a supply system which involves the greatest expenditure, and is generally the cause of most anxiety. There is no doubt that far more attention is now paid to the testing and maintenance of the network than was the case some years ago. But we are afraid that, even now, there are cable networks, more especially those of some of the smaller undertakings, which do not get their fair share of attention, owing, probably, to the fact that the staff have sufficient work to do with the plant that is always before their eyes, and that what is out of sight is often out of mind, until it is brought to their recollection in an unpleasant manner by a fault of a serious nature. We are, therefore, always pleased to see a paper on this subject presented by a practical man for discussion at a meeting like that of the M.E.A.

When dealing with conductors and the possible use of aluminium instead of copper, the author of the paper says that the former metal will make as reliable a cable as the latter; and that the question whether aluminium will be adopted for insulated cables will depend principally on financial considerations. He further says that, with copper at £60 and aluminium at £65 per ton, there is an advantage in favour of the latter for single-core cables above the equivalent of ·05 sq. in. copper; and that, with cables having the equivalent of 0·1, 0·2 and 1 sq. in. copper conductors, there is a saving of 15, 20 and 30 per cent. respectively. We think there must be some mistake in these figures, as, with copper at £60 per ton, the conductor does not account for half the cost of the finished cable, even in big sizes; and the equivalent aluminium conductor, at £65 per ton, only saves 46 per cent. of the cost of the copper, or less than 23 per cent. of the cost of the cable, even supposing the insulation does not cost any more on account of the increase of 28 per cent. in the diameter of the conductor. From calculations made by taking the prices of two finished cables, one having a conductor 1·28 times the diameter of the other, deducting the cost of the copper in the larger cable, and adding in place of it the cost of an aluminium conductor of equal section, we should put the cost of the cable with the aluminium conductor a trifle higher than that of the cable with a copper conductor of equal resistance per mile. There is, of course, an element of uncertainty about any such calculations, unless they are made by the cable maker, or by some one to whom he has imparted the secret of the exact percentage of profit he adds on his net costs of material and labour; but we find it difficult to believe that this can account for the difference of 20 to 30 per cent. that exists between the author's figures and our estimate.

With regard to insulating materials, the author's conclusions are that rubber is too expensive and has not proved permanently satisfactory; that vulcanised bitumen is suitable for medium-pressure systems, except where alkaline moisture is present; and that lead-covered paper cables are suitable for all systems and pressures, provided proper precautions are taken to prevent damage to the lead covering, and to protect any exposed paper from moisture when making joints. The necessity of carefully bonding the lead sheathing and of connecting it to earth at suitable points is insisted on, if electrolytic troubles are to be avoided. An interesting piece of information is given on the authority of Mr. Highfield, viz., that the Metropolitan E.S. Co. have some rubber cables working at 3,000 volts, which have been in use for 18 years; and we cannot help wondering whether the difference between these cables, and others that have not been satisfactory, is due to efforts on the part of the manufacturer to cut down prices to try and meet the competition of the cheaper paper and bitumen cables.

The author discusses the merits and demerits of the three most generally used systems of laying cables—viz., the direct, solid and draw-in systems, and says that the first of these is being more generally used now than some time ago. In our opinion, the slight extra cost of the solid system gives such a much better and more lasting job, that the direct system should never be used for permanent work if it can possibly be avoided. The draw-in system has great advantages for feeders, especially when it is probable that an increased section of copper will be required in the near future in busy streets; but for the distributing main, this system has little advantage over the solid system, as it is seldom that a breakdown in the distributors can be repaired without disturbing the paving and interfering with the traffic. We notice that in comparing cast-iron pipes with stoneware conduits, the latter are preferred on account of the secondary insulation they provide, which appears somewhat inconsistent with the author's remarks about bonding and earthing the lead sheathing; and even if a secondary insulation does exist, as might be the case with an unsheathed cable, it is a

very doubtful advantage, as it makes the localisation of a fault much more difficult.

The author concludes his paper with a description of an overhead line which has been in use at St. Helens since 1902 to supply energy to an outlying district. There is no doubt that there are many places where permission to use such an overhead line would render it possible to supply current at remunerative rates to outlying districts; and we think that if the author and other engineers would publish details of the cost of maintenance, which we understand is small, and of the freedom from breakdown and risk to the public of overhead lines, it might help other undertakings to get permission from the Board of Trade to erect and put into use similar lines in their districts.

THE fourteenth annual report of the Council shows that the membership of the Association now stands at 390, made up as follows:—

Committees	(Members)	167
Chief electrical engineers	(Members)	176
Honorary members ...	... ...	3
Chief Assistants	(Associate Members)	8
Assistants	(Associates)	36

A net increase of three on last year's total. Mr. J. F. C. Snell, a Past President, has accepted honorary membership of the Association.

The Council has appointed a sub-committee to inquire further into the matter of economic wiring, which has circularised all the members of the Association on the subject. The replies received were unanimously in favour of doing everything possible to bring about a set of satisfactory regulations which would allow of installation work being carried out in a less costly manner than under the present methods of casing or conduits.

The Cable-Makers' Association has promised to go fully into the whole matter, and if possible to draft a specification for a suitable standard class of material and fittings which, whilst being moderate in first cost, will comply with all reasonable restrictions tending to safety and durability.

The Electric Lighting Acts (Amendment) Bill contains some suggestions made to the Board of Trade by the Association.

Clause 6 enables the Board of Trade to authorise undertakers to supply premises outside their area of supply, under certain conditions.

Clause 16 gives power to local authorities to provide and hire out fittings, &c. In consequence of the amendment to the clause passed by the House of Lords, a circular letter was issued to Members of Parliament, asking that they should use their influence to get the clause passed in the form in which it was drafted, so that local authorities might be left with a free hand and not be compelled to have such works carried out by contractors, who, it was feared, might form a ring and thus increase prices. This circular also advocated the insertion of a new clause as follows:—

"Where in any area a local authority, company or person is authorised to supply electricity under Act of Parliament or under licence or provisional order granted under the Electric Lighting Acts, it shall not, after the passing of this Act, be lawful without the consent of such local authority, company or person, for any other local authority, company or person to supply, distribute or transmit electricity within the same area unless such supply, distribution, or transmission, is authorised by Act of Parliament, or by licence or provisional order granted in terms of the Electric Lighting Acts."

The Council has been engaged in conjunction with the Municipal Tramways Association in considering the action which is being taken by the Institute of Municipal Treasurers and Accountants (Incorporated), and a Departmental Committee in relation to the accounts of local authorities.

Attention is directed to the proposals which are being made, and which strike at the existing arrangements for the management and carrying out of all municipal work, but more especially affect the trading departments whether electrical or otherwise.

These regulations have apparently been drawn up without consultation with the heads of any municipal trading departments, and an attempt is being made by the Institute of Municipal Treasurers and Accountants to get them approved and adopted, or recommended by the Local Government Board.

If the matter is allowed to go through on the proposed lines, the control of every department, whether trading or non-trading, will centre in the Finance Committee and the Financial Comptroller, who will override the powers now exercised by the other committees and chief officers of the various departments.

It is evident that some accountants, at any rate, are endeavouring to get supreme control of all work carried out by local authorities. This would be most disastrous, more especially to all the great trading departments, where it is essential that, for the proper and economical working of the department, the same should be self-contained and each under one head. The Departmental Committee issued its report after receiving evidence from 28 witnesses, not including a single engineer-manager of any trading department.

It has been suggested that the proposals are too obviously unworkable and ridiculous to be worthy of serious attention. Since, however, the Departmental Committee has considered a section of the scheme after hearing one side of the question only, it is imperative that the matter be at once taken in hand.

The Institute of Municipal Treasurers and Accountants has approached the Chief Inspector of Taxes and the Board of Inland Revenue with a view to getting standard rates of allowances for wear and tear. The Council feels that, in questions of wear and tear of machinery and other works, the technical managers should be consulted, and it has, therefore, taken up the matter with the above-named Institution, which, however, in this matter, also has apparently endeavoured to evade co-operation, although the matters dealt with are essentially questions involving engineering experience.

The following are some extracts from the agreed terms to which exception is taken:—

"*Cables.*—In addition to repairs, allowance for depreciation shall be granted at the rate of 3 per cent. per annum *on the written-down value.*"

"*Plant and Machinery.*—On all other plant exclusive of loose tools, meters and office furniture, depreciation shall be allowed at the rate of 5 per cent. per annum *on the written-down value* in addition to the cost of repairs."

"*Conduits, Meters, Loose Tools and Office Furniture.*—No allowance shall be made for depreciation, but annual expenditure on repairs *and renewals* shall be charged as working expenses as and when incurred."

The Council on May 26th resolved that the proposed allowances for depreciation were inadequate, and should not be accepted by local authorities, and that, in arranging allowances for depreciation for the purpose of income-tax, full regard should be given to the periods allowed by the Local Government Board for the repayment of loans in respect of similar assets.

The following table shows the periods usually allowed by the Local Government Board:—

Item.	Local Government Board allowances.			Inland Revenue and treasurer's agreed terms.	
	Period of loan. Years.	Percentage per annum on original sum.	Percentage per annum on written down value.	Percentage per annum on written down value.	Equivalent life. Years.
Buildings	30	3	7	Not mentioned.	
Cables (laid solid)	25	3½	9	No allowance for conduits until renewed.	
Switchboards ...	25	3½	9	5	45
Dynamos	20	4½	11	5	45
Steam generators ...	17	5½	12½	5	45
Engines, Motor transformers, Instruments	15	6	14	5	45
Cables (in ground)	15	6	14	3	75
Lamp pillars, &c. ...	10	9	21	—	—
Receivers piping ...	10	9	21	5	45
Accumulators ...	7	13	28	5	45
Arc lamps	5	18	37	5	45

The above figures indicate the allowances or periods required to reduce to 10 per cent. of the original sum approximately.

The table shows that the two Government departments go to extremes, the one department allowing for the life of a cable being five times as great as that allowed by the other department. The extremes in each case operate to the disadvantage of the municipalities. The Board of Inland Revenue allow for the life of switchboards being twice as great, machinery generally three times and arc lamps nine times that allowed by the Local Government Board.

The Honorary Treasurer's report shows that this year there is a surplus of £42 4s. 9d. for the year, and a total surplus of £391 8s. 10d., as compared with last year's amounts of £39 4s. 10d. and £349 4s. 1d.

High-pressure Currents and Hailstorms. — The question whether the establishment of a high-pressure transmission installation is able to exercise an influence upon the path followed by hailstorms has just been discussed before the Paris Academy of Science. It was reported to the Academy that surprising alterations had occurred in the distribution of hail by the creation of such an installation in the vicinity of a mountain chain. The mountains formerly apparently exercised an attraction on hail clouds, presumably in consequence of the situation of the numerous valleys, along which the clouds were turned upwards towards the mountains. An electric transmission line on the three-phase alternating-current system, with a pressure of 45,000 volts, has recently been established in this neighbourhood, and since then the hailstorms have no longer passed along the valleys, but have travelled straight across them, following the course of the transmission line. We publish this with all reserve, for we have grave doubts as to the existence of any such effect; however, if so distinguished a body as the Academy considers it a matter suitable for discussion, we may be excused for giving it publicity.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Friction in Water Pipes.

The article in your issue of July 2nd on "Friction in Water Pipes," presents some useful information in a readily understandable manner. As, however, there is much confusion in the minds of engineers on this question, might I suggest that Box's formula gives results between those given by Darcy for new and for incrusted cast-iron pipes, only for pipes of greater diameter than about $2\frac{1}{2}$ in. For smaller diameters of pipe, Box's formula would give results less than both values given by Darcy. The relation between the results given by the two formulas, in fact, varies with the diameter of the pipe. In Box's formula for a constant rate of delivery of water, the head varies inversely as the fifth power of the diameter, while, according to Darcy, the head may be said to be inversely proportional to the diameter raised to the n power, where n is not a constant quantity, but varies with the diameter and is always greater than 5.

The smaller the diameter of the pipe the greater is the ratio of Darcy's head to Box's.

R. M. Neilson.

Glasgow, *July 8th*, 1909.

A Sensitive Microphone.

After trying a long time to get some form of telephone which will catch the sounds of the human heart, I have happened on a form of transmitter which does so partially, at least, and which gives other results which may interest your readers.

The innovation is merely to introduce one or more pieces of copper wire (about No. 22 size) into a mixture of carbon granules with iron and aluminium filings. It seems to me a better result follows if you insulate the copper wire; and then coil round it (after induction coil fashion) a much finer wire (about No. 42 or thinner). This combination I have enclosed in an ordinary carbon cup transmitter.

You must be careful, of course, that the wire does not make contact with the diaphragm (I have found a carbon one the best), and that the filings are not in mass on top of the granules, in contact with diaphragm.

If this be fairly carefully done, I think anyone will find, on comparing under equal conditions a transmitter charged as above with one charged with simple carbon granules, that the former shows more sensitiveness and a real magnification of sound. I only judge by the following three tests:—

1. Putting a watch in contact with transmitter, and seeing how far from one's ear one can hold the receiver and still get the watch-tick.
2. How far from a clock you can place transmitter, and the clock-tick be heard in receiver placed right on ear.
3. The pulsations of one's heart.

If your readers are interested, a few more details could be given (even a theory to account for the thing).

J. W. Pickford.

Cleethorpes, *July 8th*, 1909.

E.M.F. in a Dead Underground Cable.

I have read with great interest the various letters *re* the above, and think that the following experience may not only be of interest to many of your readers, but explain the cause of the shock received by "Enquirer's" jointer.

I had on one occasion to investigate a fault which occurred on an overhead line and sub-station connected to a 10,000-volt system, and used for giving a supply to a large colliery. The fault proved to be intermittent, and therefore very elusive to locate, so it was decided to make the gear alive in sections. This was done, and the line proved to be quite O.K., but the moment the sub-station was energised one of the oil switch insulators broke down, causing one phase to be earthed. The switch case was efficiently connected to an earth pipe, buried in coke breeze, generally reckoned to be one of the best methods of providing a sound earth. The centre point of the star-wound generator at the power station, about six miles away, was earthed through a large resistance of 48 ohms, so that there would be current flowing between the sub-station earth and the power station one, causing a difference in potential between them, which would be large or small, depending on the amount of current passing and the nature of the earth circuit. In this case the earth circuit would be of fairly high resistance, as there were no gas or water-pipe lines or tram rails.

After locking out the feeder and examining the faulty insulator, I was leaving the sub-station, when the mine foreman reported that as the signalman at the pit bottom took hold of the signal lever to signal to the engineman in charge of the winding engine, he received a very severe shock, which knocked him head over heels.

The explanation of this is that as the power station was built practically on top of the coal bed, the coal bed at the pit bottom, on which the signalman was standing, would be at practically the same potential as the power station earth, and the signal wire from the pit head would be at practically the same potential as the sub-station earth, so that any difference in potential between the two earths would be felt at once by the man touching the signal lever.

In the case of "Enquirer's" jointer, the cable sheath must have been acting as a pilot from an earth in a district where the lightning discharge took place, and which would, therefore, for a second or so, be at a much higher potential than the surrounding districts, in one of which the jointer was working, so that when the discharge took place the jointer got a shock in the same manner as the signalman in the instance mentioned above. The whole proof of this explanation rests on the question "Was the cable sheath at the sub-station end connected to earth?" and I should be glad to hear from "Enquirer" if it was.

J. W.

Metal Lamps.

Recent technical papers have been full of pyrotechnic displays in journalese on the subject of the lighting achievements on the part of a certain firm of electric lamp manufacturers who have recently placed before an enthusiastic and grateful public a 16-C.P. 200-volt lamp. Now that the period of excitement has passed, is it not time to ask ourselves what we really have got? There are several lamp makers who have advertised their 25-C.P. tungsten lamps at an efficiency of about 1 watt per Hefner candle, but so far it has only occurred to one firm to make that lamp and under-run it until it gives 16 C.P. at an efficiency of 1·56 watts per candle. In these times of strenuous and skilful advertising, it will pay the consumer and the retailer to read advertisements with both their eyes skinned.

Slide Rule.

[A tungsten lamp giving 25 C.P. at 230 volts, 1·25 watts per candle, will give about 16 C.P., 1·5 watts per candle, we believe, when under-run at 210 volts. But has such a lamp been made, other than the one mentioned above? The nearest approach to it apparently is one advertised by the Deutsche Gasglühlicht A.G., in the *E.T.Z.*, on July 1st, stated to give 25 hefners at 200—240 volts, with an efficiency of about 1·25 watts per hefner—say, 22·5 C.P. at 1·39 watts per candle. At 1·5 watts per candle, this lamp would probably give about 20 C.P.—EDS. E.R.]

Municipal Trading and the Electric Lighting Acts (Amendment) Bill.

I am obliged to "Borough Electrical Engineer" for his reply to my last letter, but should have been still more so had he answered the two questions I then put to him.

Will he kindly also give the grounds upon which he bases his statement that "in the House of Lords there were representatives of one class only." One would have thought that the House of Lords contained more men interested in municipal life than in electrical contracting, but doubtless before making his very positive assertion he investigated the matter, and it would be interesting if he would give us the results. He also states that "the municipalities had no chance of stating their case." What is his authority for this statement?

"Borough Electrical Engineer" claims for a municipality equal powers to those of a supply company, but he appears to overlook the fact that the latter is a purely trading body

established for the purpose of making profits, which a municipality is not. Further, shareholders in a supply company become so of their own free will, whereas in the case of a municipality all the ratepayers are virtually compulsory shareholders.

In the same way his contention that a contractor "has as much grievance against a new private contractor opening up as he has against a municipal wiring department opening, no more and no less," would only be true if the new wiring contractor were able to raise a portion of his requisite capital on the security of the existing contractors, and also compel them to bear a share of any loss he might make in his business. This would scarcely be called fair competition, yet it is the position of a municipality opening a wiring department.

"Borough Electrical Engineer" charges me with deliberately misquoting his article, but he is good enough to give in full the original words of his article, and my quotations from the same, and I could wish for no better refutation of the charge. The only part of his original article with which I (as a contractor) dealt, was the portion dealing with the wiring contractors' grievance, which was stated to be at the outside a matter of 4s. 2d. per annum, this being based upon a loss on the municipal wiring department equal to a 1d. rate. It was solely this so-called "outside" figure with which I dealt, contending that it should be enormously increased, and yet I am charged with "deliberate misquotation and perversion," because I did not quote from the original article to the effect that in the author's opinion the loss would in many cases be less, in fact, "usually nil" as the wiring department "usually pays."

In my first letter I assumed that "the average loss made by a municipal wiring department does not exceed 10 per cent." Twice has "Borough Electrical Engineer" characterised this as "absurd," but whether because the figure taken is too high or too low I have not yet been able to ascertain, although I definitely asked him the question in my last letter. Perhaps he will tell us upon what percentage of of average loss he based his outside figure of the loss on a wiring department being equal to a penny rate.

I am glad to note considerable modification in "Borough Electrical Engineer's" previous attack upon contractors—in his last letter his strictures were against contractors generally, but they are now narrowed down to the black sheep from whom, unfortunately, no fold is free. But is it right that the many should suffer for the few?

Contractor.

Electric Lighting Acts (Amendment) Bill.

May I direct the serious attention of electrical companies to the grave danger of allowing this Bill to pass in its present form? The Bill does not give effect, as might be inferred from the memorandum accompanying the Bill, to the recommendations of the Joint Committee of 1898, nor does it carry out the promises made by a former President of the Board of Trade. On the other hand, it imposes fresh conditions of a very onerous kind on electrical companies.

The effect of Clause 6 is to empower the Board of Trade to authorise a local authority to supply outside its area, and to compete with a company without the consent of such company, while a company can only be authorised to supply outside its area, and compete with a local authority, with the consent of such local authority.

Clause 13 relates to the audit of companies' accounts. Under this clause a company may be compelled to comply with the recommendations and requirements of the Board of Trade auditor in regard to matters affecting the interests of the authority empowered to purchase the undertaking. In view of the fact that many electric lighting companies have agreed with the local authorities on special terms of purchase, this clause is exceedingly dangerous to the interests of such companies.

No one doubts the impartiality of the Board of Trade officials, but they cannot be expected to do more than fairly interpret the law, and if this Bill becomes law many electric lighting companies are certain to suffer grievous injustice. It is safe to say that there is no precedent for this kind of legislation in the law affecting any other industry in this country.

Does anyone still doubt the urgent necessity of the electrical industry possessing some organisation which will protect its interests in these matters?

E. Garcke.

Electrical Federation Offices,
London, W.C., *July 12th*, 1909.

[Our readers will find a summary of the proposals of this Bill, together with our critical commentary thereon in a leading article that appeared in our issue of March 26th, 1909, page 502. Notices have been filed of numerous amendments, and we give some particulars of these in our "Parliamentary" columns to-day. We have a good deal of sympathy with the views advanced by our correspondent in the above letter, as reference to our article will show, but it seems to us that only a sectional organisation representing electrical companies can act with a view to protecting companies' interests. If a national organisation which counted among its members municipal electrical undertakings were to endeavour to protect interests of this kind, it would be acting in direct opposition to the desires of part of its membership!—Eds. E.R.]

The Ethics of Advertising.

It may interest you to know that the data which you reprinted in your last issue under the heading "Ethics of Advertising," were made up by me for the use and instruction of our salesmen. Only three dozen copies were printed or neostyled.

The assertion, therefore, that these data have been sent out as a circular or with statements, under the cloak of anonymity, is untrue.

If your correspondent obtained a copy, it must have reached him by other means than "Fair Play," under which *nom de plume* he hides his identity.

Whatever code of etiquette may hereafter be drawn up, I am satisfied that it will never be considered unfair for a tungsten lamp maker to point out that the tantalum lamp, though a metal-filament lamp, has not the efficiency of an Osram or tungsten lamp.

James Young Fletcher,
Manager, Osram Lamp Department.
The General Electric Co., Ltd.

London, E.C., *July 13th*, 1909.

I also was the recipient of the circular dealing with various types of incandescent lamps alluded to by your correspondent "Fair Play," and so far as I can find out from my friends, it seems to be thought that the lamps in the second column and the lamps in the fourth column of this leaflet proceed from works which are closely connected. If this is so, it seems unfair that this little fact should not be stated in the comparison table. It is not cricket, any way.

Interested.

The Prevention of Smoke.

I have read with great interest the paper on "The Prevention of Smoke," by Mr. Wilfred Yorke, A.M.I.E.E., in your issue of 2nd inst.

Possibly it is the more "interesting" because so misleading that it will put people on the wrong track when trying to get rid of smoke, either with chain grate stokers or any other stokers.

Mr. Yorke's suggested panacea of letting in air over the fire is the same old device used by innumerable patentees from the early days.

The actual causes of the smoking of a chain grate, once the arch has become incandescent, are probably:—

1. Too short an arch to complete combustion.
2. Too thick a fire for the draught.
3. The running of live fire over the back ends.

The remedies are obvious. The best way to run a chain grate with a given amount of draught, so as to get the most steam from the boiler, is to run it with as thin a fire as possible, within the limits of complete combustion of the fuel before the clinker is delivered over the end of the grate, thereby ensuring the lighting-back of the fuel as it enters the furnace up to the doors. In this way the resistance of

the fire-bed to the entrance of the air is lessened, and the largest amount of air compatible with the draught can be got through the grate. By this means the largest possible amount of fuel can be burnt with the chain grate stoker.

Speaking from a wide experience with many types of boilers and stokers, I can say that I have never found it necessary to introduce cold air in the wrong place. If it is put through the fire in the right quantities for the fuel that has to be burnt, other conditions being right, smokeless combustion ensues.

It will be noted in the test Mr. Yorke gives, that the CO_2 dropped from 12·6 to 10, showing a considerable loss in efficiency. Surely Mr. Yorke must know there are many chain-grates working, in which 12·6 CO_2 can be got with an absolutely smokeless chimney? If by any chance he is not practically acquainted with them, I shall be pleased to help him in his investigations.

The emission of smoke can be prevented either by the use of chain-grate stokers, or by the use of coking stokers, the latter being considerably cheaper and quite as efficient. The latter have the advantage that it is possible to introduce more air through the fire than can be done with natural draught suction only, so that grate area for grate area the coking type of stoker will do the most work. Where, however, the available space for grate area is large, the chain-grate may be the better machine to install—circumstance must largely govern the choice.

A. W. Bennis.
pro Ed. Bennis & Co., Ltd.

Bolton, *July 12th*, 1909.

Temperature Errors in Shunted Ammeters.

I have noticed a letter from Mr. Ernest F. Moy in your issue of the 9th inst., and am interested to find that he has experienced the same difficulty of false reading in shunted ammeters, due to thermal effects.

With regard to the actual cause of the heating of the shunt at one end, I do not think that his explanation is adequate, and I have reasons for thinking that my explanation of bad contact (although it is very simple), is the correct one, and that Mr. Moy's explanation, although very interesting, is out of the question. The reasons are as follows:—

1. We have on the switchboard quite a dozen similar shunts, and they do not heat particularly at either end.

2. The particular shunt in question gives no trouble, now that the contact has been carefully cleaned and remade.

Seeing that no alteration has been made in the material, in the position of the shunt, or in the current passing, it is clear that bad contact was the cause, and that the effect which Mr. Moy quite correctly describes, is, at ordinary current densities, quite negligible.

W. Fennell.

Electricity Works, Wednesbury.
July 12th, 1909.

With reference to Mr. Fennell's article on shunted ammeters in your issue of June 25th, it is unfortunate that he gives no particulars regarding the volt drop at full load across the shunt he used in his experiments.

Without this figure and the maximum scale reading of the ammeter, one is unable to take out figures for the temperature of the hot end of the shunt, but even if the shunt were constructed of copper and constantan, the temperature must, it seems, have been abnormally high.

These thermo-electric troubles can be practically eliminated by using manganin for the resistance strip—the combination, copper and manganin, having very roughly about $\frac{1}{16}$ of the thermo-electromotive force of a copper-constantan combination for the same difference of temperature.

Charles H. Wright.

Chelmsford, *July 7th*, 1909.

The article and correspondence on the above subject tend to upset all our preconceived ideas of thermo-electric phenomena. Except in manner of expression, Mr. Moy seems to agree with Mr. Fennell that it is possible to record a thermo-electric current of 10 amperes on an ordinary commercial ammeter by means of the fluctuations of temperature which occur in the daily routine of electric generation, because, as Mr. Fennell puts it, the junction was composed of lugs, one of which was tinned while the other was raw copper.

Mr. Moy suggests that the "false reading" was due to the difference between the P.D. of the thermal couple at the cold end of the shunt and the P.D. of the couple at the hot end, but would it not be more instructive to know something of the value of those P.D.'s? What was the difference of temperature between the junctions to generate a pressure or to alter the P.D. sufficiently to oppose the "legitimate E.M.F." and show a — current of 10 amperes, and what was the junction composed of which when "dead" and heated with a blow lamp showed a current of more than 10 amperes?

The couple which gives the highest known thermo-E.M.F. consists of "constantan" (Cu 60 per cent. Ni 40 per cent.) and copper. It is possible to get 37 micro-volts per degree C., but if we take copper and tin it is much less, namely, 0·1 for each metal, and as both are of negative quantity, 0·1 − 0·1 = 0·1, which multiplied by 80° C. = $\frac{8}{1000000}$ volts, but this seems too infinitesimal to successfully oppose an E.M.F. used for practical purposes, even if it is only the small portion passing through the shunted instrument.

W. C.

Wednesbury, *July 7th*, 1909.

[We do not follow our correspondent's arithmetic. As regards the thermo-electrical effect, the only question is the magnitude of the current that could be sent round the circuit composed of the shunt and the moving coil of the ammeter by the thermo-E.M.F. set up at the heated contacts, quite regardless of the actual current flowing in the main circuit. Mr. Fennell's experiment, showing that when the main current was zero and the contact was heated with a lamp, the E.M.F. sufficed to produce an indication corresponding to the passage of 10 amperes under normal conditions, appears to us to be conclusive. Of course, the current actually generated and flowing in the circuit would probably be only about one-thousandth as great.—Eds. E.R.]

New Home Office Regulations.

Mr. Johnston's letter appearing in your last week's issue confirms the misunderstanding that a number of engineers are under, regarding the above, judging from the correspondence we have had on the subject.

Mr. Johnston's supposition that the word "not" appears in error in the last sentence of the second paragraph, Clause 13, is incorrect. If it were the case, the immunity against shock, should the lampholder become alive, would be entirely dependent upon the reliability of the earthing connection. The regulation, however, calls for the lampholder to be completely protected against the liability of hand contact or metallic connection with any metal work of the portable lamp, and to achieve these conditions it is necessary for the lampholder to be completely insulated.

This arrangement acts as a two-fold precaution against all possible shock, as even with a live holder, if the insulation of the lampholder is efficient, as in our Guardian hand lamp, the portable lamp is absolutely "shock-proof."

It does not appear to be generally understood that the the adoption of a "shock-proof" portable lamp is an alternative to the necessity of earthing. A similar alternative equally applies to the remarks regarding the earthing of pendant lampholders occurring at the beginning of the second paragraph under Clause 13, and also contained in Clause 21. In these cases the use of a "shock-proof" lampholder, such as the Guardian pendant lampholder, avoids live lampholder dangers, and dispenses with the necessity of earthing. We understand, what we think will be of general interest, that an explanatory memorandum is being issued by the Home Office authorities dealing with the above and other matters contained in the new regulations.

For **The British Central Electrical Co.,**
E. S. Conradi.

London, E.C., *July 12th*, 1909.

LEGAL.

J. Musgrave & Sons, Ltd., v. Bradford Corporation.

A Question of Costs.

In the King's Bench Division, on Thursday, July 8th, this case was mentioned to Mr. Justice Darling on a question of costs.

Mr. Hutchinson appeared for the defendants, and said that the action was tried by his Lordship, and a question now arose on the form of the certificate given by the Master in regard to the costs of the action. His Lordship gave judgment for the defendants on the claim and counterclaim, with £10 damages in respect of the latter. His Lordship gave defendants the general costs of the action and the counterclaim, except on the issue on which they had failed.

Mr. Disturnal, for Messrs. Musgrave, pointed out that if the order went as drawn up, the plaintiffs would be deprived of all costs, and that he submitted was not what his Lordship intended.

His Lordship said he thought that the certificate as the Master had drawn it up, expressed his intention with the exception of one point. With regard to that, the following words must be inserted:—"Except so far as regards the counterclaim as to the issue concerning the defective workmanship of the shaft. Upon that issue the defendants will not get costs as against the plaintiffs, neither will the plaintiffs against the defendants."

Beardwood v. Bury Corporation.

At the Manchester Assizes on 8th inst. William Sidney Beardwood claimed damages for personal injuries. He said that on November 30th last he went to Bury, and in the evening attempted to board a Radcliffe car opposite the Knowsley Hotel. He had one foot on the step when the car started, and he fell, dislocating his left shoulder. It was three months before he recovered the full use of his arm, during which time his business suffered, as he was unable to give proper attention. For the defence it was suggested that Beardwood, on being told that the car was not going to Whitefield, got off while it was in motion, though warned not to do so. The guard stated that he put his hand on the plaintiff's shoulder to prevent him alighting while the car was moving.

The plaintiff was awarded £50 damages.

Metropolitan Electric Supply Co., Ltd., v. Uxbridge and District Electric Supply Co., Ltd.

A motion in this matter for the appointment of a Receiver of the defendant company was before Mr. Justice Neville in the Chancery Division on Tuesday last, but with the consent of all parties it stood over for a week.

It was stated that the applicants had just had affidavits from the other side which they desired to answer.

Laird v. Erith Oil Co.

At Dartford County Court on July 7th, before Judge Emden, Wm. James Laird, a wharf labourer, sued the Erith Oil Co., Ltd., for damages for injuries received through an electric shock.

Plaintiff stated that whilst at work on a barge, he took hold of a chain from an electric crane, and feeling the current he called to the crane driver to switch it off. He did so, but plaintiff could not release his hold, and it was not until the current was switched off that he could do so. By that time he had lost consciousness.

Counsel for the defence admitted that the accident happened, but contended that it was without negligence on anyone's part. It was explained that the accident was due to a defective cable, not protected, lying across the rails on which the crane worked.

Judgment was given for plaintiff for £75 and costs.

North-Western Electricity and Power Gas Co.

The petition by Harper Bros. & Co. and others for the compulsory winding up of this company, was again before Mr. Justice Neville, in the Winding-up Court, on Tuesday last.

Mr. Hansell, for the petitioners, now stated that the petitioners' debt had been satisfied, and they were willing to have the petition dismissed, with costs.

There was no opposition to this course being adopted, and his Lordship dismissed the petition accordingly.

Sequel to Fife Pit Explosion.

The hearing of actions by miners and their dependants in connection with the recent explosion in the Fife Coal Co.'s pit at Lochore, has resulted in damages being awarded, ranging from £300 to £500. The accident took place in the Mary Pit, the deepest in Fife. In the course of operations inflammable gas was met with, and safety lamps only were in use. A fan, driven by an electric motor, circulated a current of air throughout the workings. Prior to the accident several miners were waiting at the mid-working station until the fireman reported that all was safe. The fireman went forward to the motor and switched on the current, the pursuers stated, and immediately a terrific explosion took place. Three workmen were killed or fatally injured, and others received injuries. The pursuers imputed the fault to the defenders in respect that their system of working was defective, and that they failed to observe the rules. The company contended that the accident not being attributable to their fault, or to the fault of those for whom they were responsible, or to any defect in their system of working the mine, they were entitled to absolvitor. After a three days' trial, the jury returned a verdict for the pursuers. Other claims were settled.

Fanshawe v. Salford Corporation.

On 9th inst. an action was heard at the Manchester Assizes, before Mr. Justice Hamilton, in which Mr. George Henry Fanshawe, a clerk, residing at Stanley Grove, Eccles, sought to recover damages against the Salford Corporation in respect of an accident on January 11th, by which he lost a leg.

The allegation of the plaintiff was that whilst a passenger on one of the Corporation tramcars he was hustled off the car by the conductor and fell in the roadway, his leg going under the wheels of the car. On the other hand, it was contended by the Corporation that the plaintiff was under the influence of drink, was quarrelsome and disorderly, and that it was while attempting to strike the conductor that he fell under the car.

The jury found for the plaintiff, and awarded £500 damages. Judgment was given accordingly.

Bray v. Rawtenstall Corporation.

At the Rawtenstall County Court monthly sitting just held, Judge Hamilton heard an action brought by Mrs. Dorcas Bray, a widow, of 5, Queen Street, Cloughfold, for personal damages sustained in a runaway tram disaster between Rawtenstall and Haslingden on Christmas Eve last. The Corporation, as owners of the car, did not deny liability. The car ran backwards a distance of over a mile down a declivity, and one of the passengers who jumped off the vehicle was killed. Mrs. Bray sustained a fractured jaw, a bruised shoulder, a cut arm, and severe shock to the system. It was stated that probably she would never recover. She claimed £100, and the Corporation had paid £30 into Court. Judgment was given for the plaintiff for £60.

The Johannesburg Contract—Appeal.

On Tuesday, July 6th, the House of Lords, consisting of the Lord Chancellor and Lords James, Atkinson, Gorell and Shaw, allowed an interlocutory appeal by the Municipal Council of Johannesburg against a decision of the First Division of the Court of Session. The respondents were D. Stewart & Co. (1902), Ltd., Glasgow, William Beardmore, shipbuilding and steel manufacturer, of Victoria Street, London, and Mrs. Joseph Beardmore sued as the executrix of her late husband.

The action arose out of certain contracts under which the respondent company contracted to supply the appellants with gas producer and electric generating plant for electric lighting, power, tramway and other purposes. The Town Council of Johannesburg, in September, 1903, resolved to install plant for the production and supply of electrical energy for municipal purposes, and issued forms. The specifications were divided into sections, and the tenders made by Messrs. D. Stewart & Co. (1902), Ltd., Glasgow, for Sections B, C, D and E (the last three being electrical generating machinery) were accepted. The plaintiffs in the action claimed that as the defendants were in breach of their contracts, they were liable to repay to the Council the payments already made on account of the contract price, and to pay them damages for breach of contract.

The present appeal, so far as this part of the action was concerned, related entirely to the determination of the tribunal and procedure by which this question between the parties was to be settled, the appellants contending that the question fell to be decided by the Court being outside the scope of the arbitration clauses contained in the contracts. The Court of Session decided that the question should be decided by arbitration in England. Further, they dismissed the claim against the sureties as being premature.

The Municipal Council appealed, and in the course of the arguments, it was stated that the sums claimed against the Scotch company were in all £418,694, and against the sureties (Mr. William Beardmore and the executrix of Mr. Joseph Beardmore) £115,134.

At the close of the arguments, the Lord Chancellor expressed the opinion that the arbitration clauses were to be construed according to English law, and that so construed the Courts had power to enforce the contract. He was further of opinion that the suit against the sureties had been wrongly dismissed.

The other noble and learned Lords concurred, and the appeal was allowed, with costs, and the action was directed to be tried in the Scotch Courts.

Mr. Clyde, K.C., Mr. T. B. Morison, K.C., and Mr. Mitchell appeared in support of the appeal, instructed by Faithfull & Owen for P. Morison & Son, Edinburgh; Sir Robert Finlay, K.C., Mr. Macmillan, the Hon. W. Watson and Mr. Fletcher Moulton, instructed by Nicholson, Graham & Beesly for Davidson & Syme Edinburgh, were for the respondents.

OUR LEGAL QUERY COLUMN.

[Questions addressed to this column should be written on one side of the paper only.]

"Legal" writes:—"Will you be kind enough to advise on the following? A builder owns an estate on which he lays out 100 small houses, and contracts with the electricity supply authority to wire the whole of the houses on the estate; the authority on their part agree to supply the current at contract rate per lamp demanded, and lay all cables and connections free of charge. Later, when the builder wishes to get a supply of gas into each house for cooking and heating purposes only, have the gas company a right to refuse to lay the mains for this purpose apart from lighting? In several parts of the country known to the writer the gas authorities, although not giving point-blank refusal to lay the necessary gas mains and pipes, are pressing the builder to put in gas pipes for lighting purposes also. Are they not exceeding their right in so doing? And is not the builder entitled to a gas service for heating and cooking only—*i.e.*, for all domestic purposes other than lighting?"

*** This is a question the answer to which depends upon the statutory terms under which gas is supplied in the district in question. These may or may not be different from the terms laid down by the Gas Works Clauses Act, 1871. That Act provides (by Sec. 11) that the undertakers, upon being required to do so, shall provide gas for any premises within twenty-five yards from any of their mains; and (by Sec. 36) that whenever the undertakers neglect or refuse to give a supply of gas to any owner or occupier of premises, within the limits of the special Acts, entitled to the same, under such pressure as is prescribed, they shall be liable to a penalty not exceeding forty shillings for each day during which such default continues. It is possible, of course, that the provisional order under which gas is supplied in the district in question makes special provision for the supply of gas for purposes other than lighting; but all consumers in the district must receive equal treatment. If "Legal" could procure a copy of the provisional order under which gas is supplied in his district, he could probably answer all these questions for himself.

REVIEWS.

Electric Lighting and Power Distribution. Vol. I. By W. Perren Maycock, M.I.E.E. London: Whittaker & Co. Price 6s. net.

This is the seventh edition, and is practically re-written. It is specially suitable for students preparing for the Elementary and Ordinary Grade Examinations of the City and Guilds of London Institute, and has, indeed, been used for many years throughout the country for this purpose. In the present volume there are 167 more pages and over 100 more illustrations than in the previous edition, rendered necessary by the advance in the science; but the book is still very compact and of a size suitable for students' use.

Though the work as a whole is elementary, yet the student is supposed to be acquainted with the fundamental principles of magnetism and electricity, and to have a knowledge of simple algebraical equations and their manipulation. Given these, he should find that he has before him one of the best text-books of its kind, and should have little difficulty, if he be in earnest, in mastering sufficient of the subject to enable him easily to pass the above-mentioned examinations.

How very difficult it is to write a good text-book on elementary electrical engineering; what a nice balance must be struck between theory and practice, between mathematics and experiment, between the fundamental and side issues! Little wonder, indeed, that a suitable work is rare and difficult to obtain. The work under review, however, as is evidenced by a popularity of so many years, to a large extent satisfies the needs of the student, and we cannot fail to be struck on perusal of its pages with the orderly and systematic arrangement, with the clear and succinct definitions, with the original and suitable illustrations, and with the care taken to touch upon and explain only those parts of the subject that are of fundamental importance to the young engineer.

With regard to resistances the author contents himself with a few well-drawn figures, thus fixing the mind on principles and not confusing it with useless and academic side exercises. Fall of potential is illustrated by hydraulic analogy—the diminution of head through resistance of water flowing in a pipe. This is good in its way, but we think that few of the students who will find this book useful will have actually seen the experiment for themselves, and unless they have done so the analogy is useless, as this particular experiment is one that must be seen to be believed.

In describing the effects of current, a section is given to the phenomena of radiation, a novelty in a work of this kind. Mention is made of cathode rays and Röntgen rays, the peculiar effects of the latter being well detailed, and a diagram of their effect on the fluorescent screen inserted. A point that is very noticeable with regard to the direction of the field induced by a current is a number of excellent diagrams, which show a student very clearly the relation between current and field. We have seen nothing like this before, and we know from experience that the teacher will find them very valuable indeed. A similar diagram is the one determining the polarity of a solenoid or of an electro-magnet.

Under the section "Experiments on Induction," we have again to note the very luminous diagrams on the motion of a current-carrying conductor when placed in a magnetic field, and the diagram illustrating magnetic drag. The latter is particularly interesting, and gives a student, at a glance, a reason for the phenomenon. A very useful chapter is that which deals with electric bells, contact makers, fire alarms, rules for bell wiring, indicators, relays, circuit diagrams, earth returns and telephones; the circuit diagrams are especially interesting and clear.

In Chapter VI, that most difficult matter to the young electrical engineer, the laws of magnetomotive force, is taken up. We consider this one of the best chapters ever written on this subject for an elementary student.

Chapter VII is on electrical measurement, and we notice that the illustrations here resemble the stuff we are accustomed to see in the workshop, and not the prim, impossible apparatus we behold in many text-books.

The last chapters have to do with the construction of the dynamo, the examples chosen being up-to-date modern specimens.

On the whole this book is the best of its kind that we have come across, and it is safe to predict that the new edition will enhance its popularity.

Heat for Engineers. By Chas. R. Darling. London: E. & F. N. Spon, Ltd. Price 12s. 6d. net.

As pointed out in the preface, the author seeks to deal with the "numerous applications of heat in modern industrial processes, and to furnish the information and data required for a correct understanding of the thermal phenomena involved."

The book consists of 21 chapters and some 415 pages. Amongst the chapters are those on "Practical Applications of the Property of Expansion," in which pendulums and steam traps are dealt with.

There is a chapter on "The Measurement of High Temperatures," and pyrometers of all types are dealt with, from Wedgewood's to the more recent Callender, Roberts-Austen, and Le Chatelier types.

Another interesting chapter is that on "Practical Applications of Fusion and Allied Phenomena." Here the action of water sprinklers is dealt with, and the use of sodium acetate in footwarmers.

Low temperatures are discussed in Chapter XV, and the following chapter gives complete descriptions of refrigerating apparatus. The various refrigerators illustrated would rejoice the heart of Sir Francis Bacon, who lost his life through a chill caught by packing a chicken in snow to see whether its flesh could be preserved. The temperature necessary to preserve most meats, vegetables, &c., is about 33°-40° F., and only in a few cases is it necessary to go below 32° F. by a few degrees.

The lagging of steam pipes is dealt with on page 323, and there the author gives an improved electrical method of testing laggings.

Ventilation, fire grates, and chimneys follow, and the limitations of formulæ are discussed. Electric radiators receive rather drastic treatment towards the end of this chapter, and one might suggest that here "comparisons are

odious," and that electric radiators are very nice things if one can afford them. In order to make a strict comparison, the fact that coal is burnt in a coal fire when it is not wanted has to be considered, and servants' wages reckoned at so much per hour must be taken into account. Perhaps if the author did this instead of merely comparing heat units in an unpractical manner, he would be surprised to see what happens in cases where rooms have to be only temporarily heated.

The final chapter discusses the losses in steam engines and refrigerating machinery.

We congratulate the author on producing quite a useful treatise. The task of teaching "Heat"—a somewhat "dry" subject (as students generally remark)—in a practical way is no easy matter, and the present work stands almost by itself as the only treatise on "Practical Heat."

It is well printed and illustrated.

Boiler Feed Water. By F. A. Anderson, B.Sc. (Lond.). London: The *Electrician* Printing and Publishing Co. Price 6s. net.

This is an attempt to place the subject of boiler incrustation and corrosion fully before the engineer, with special reference to the reduction of the hardness of water, to which incrustation is due.

Probably most hard waters can be treated fairly well by the Clark process and its modifications, but with many waters there are complications of which the engineer should be aware. Lime will remove lime carbonate wholly, but to remove lime sulphate requires soda, and the sulphate is not removed; it is only converted into a new soluble salt of soda, and gives rise to a danger, for it may concentrate in a boiler, and cause trouble.

An engineer in charge of boilers must be alive to all their tricks, and alert against being caught napping. He can see the coal fed into the furnace, but the feed water goes in unseen, to perhaps, tenfold the weight, and may carry in great quantities of salts.

The author confines his studies chiefly to the ordinary lime and soda re-agents. He makes very little reference to the barium salts; perhaps he thinks they are still outside the realm of practical cost. But the barium salts, for sulphate reduction, more especially, deserve more mention, if only to urge on some electrochemist to study their formation electrolytically.

A few boiler scale analyses are tabulated as examples, two of them from Canada showing high percentages of magnesium salts. The analysis of a scale is no sure criterion of what was in the water. The author explains the various reactions which cause this and other apparent anomalies.

Under the head of corrosion we find no reference to that which often goes on under an apparently clean white sulphate scale. This sort of corrosion may be found in boilers at Burton.

On the other hand, the author suggests a case of two waters, harmless alone, but which would cause corrosion if mixed. This is quite true, and we have known where a pair of Yorkshire streams appeared each to be very good for boilers, yet when they were mixed a few hundred yards lower down, a boiler fed with the mixed water was corroded rapidly.

Also, water that is good enough for low pressure may be corrosive at modern pressures, for the higher temperature may change the behaviour of some of the salts present.

Chapter III is the chemists' chapter—for use in the laboratory—for it deals with water analysis and soap tests. Chapter IV is a continuation of it, and Chapter V deals with the practice of water softening, no attempt being made to describe the details of apparatus. Their action is described generally, and the results are given in formulæ. Silver and phenolphthalein tests are cited, and stress is laid on the importance of pure lime, such as "Buxton," by which, of course, is generally meant Derbyshire lime from the carboniferous rocks of that county.

White chalk lime is good, but hydraulic or aluminous limes, such as Dorking gray lime, are less suitable. The various forms of soda are described, and the cost compared per 1,000 gallons softened of interchangeable re-agents. An interesting question is discussed by the author in respect of how far it is desirable to deal with magnesia. He thinks that if lime carbonate be removed, magnesia may remain if present in other than the carbonate form. Magnesia has, he says, little tendency to form scale.

Thus, it will be seen that the author has thought on his subject, and, perhaps, stirred up controversial matter. And we seem to see between the lines that the lime and the soda treatments are not all-satisfying. As Punch's footman thought, with his beef and mutton diet, it was high time another animal was invented, so, perhaps, it is high time another softening re-agent was discovered. Barium salts have points of great excellence. True, they are poisonous and have a huge atomic weight. But, on the other hand, they are insoluble and cannot exert their toxic property. They have peculiarly good qualities for easy use, and the author, as we have said, might give room to a discussion of them in a future edition.

A sixth chapter treats of grease in boilers. Has the author sufficiently considered the supposed danger of greasy water and magnesia salts?

The removal of oil is very difficult. The de Laval cream separator will take out much of the oil from condensed water, but does not seem to take it all out. Then there are electrical methods, said to be very efficacious, and methods of coagulation.

We can hardly agree with the paragraph on page 130, which says that in softening circulating water it is only necessary to deal once with the main quantity and then to soften the make-up. This might be true if softening did remove all the scale-forming matter. But it does not; circulating water by constant evaporation becomes as "hard as a brick-bat," and must be repeatedly re-softened.

A final chapter on steam boilers contains some good general advice on boiler setting and management. We might add to this, that when there is the slight risk of grease getting into a boiler, the latter, when laid off, should be well blown off by way of its scum trough, so as to remove floating grease and prevent it from settling down on the plates when the boiler is finally blown down in the usual way. Turning over a page, we find the author recommends this very safeguard at page 142.

BUSINESS NOTES.

Electrical Enterprise in the Near East.—At the end of April we announced that an international financial group had been formed for the promotion of electrical enterprises in the Orient, and that a trust company would first be constituted at Zurich. The latter has now been established under the title of the Union Ottomane, Société pour Entreprises Electriques en Orient, with headquarters at Zurich, and with a share capital of £480,000 divided into £20 bearer shares, of which one-half has provisionally been paid. The objects of the company are the initiation and execution of all kinds of transactions which refer either directly or indirectly to the erection, purchase, working, transformation and the sale of electrical undertakings, and in particular those which aim at lighting, the transmission of power, railway working and electro-chemistry in the Orient. The promoting syndicate, which is headed by the Deutsche Bank of Berlin, comprises the following influential firms and individuals:—

Société Générale, Paris.	A. Spitzer & Co., Paris.
Banque Impériale Ottomane, Paris.	Josse Allard, Brussels.
Thalmann & Co., Paris.	Commerz und Disconto Bank.
Continentale Gesellschaft fur Elektrische Unternehmungen.	M. M. Warburg & Co.
Commerzienrat A. Walker.	Elektrische Licht und Kraft Anlagen, Berlin.
Paul Dansette, Brussels.	Jacob S. H. Stern.
Mitteldeutsche Credit Bank.	Vienna Bank Verein.
Gebruder Bethmann.	Bank fur Elektrische Unternehmungen, Zurich.
Gesellschaft fur Elektrische Industrie, Baale.	Schweizerische Credit Anstalt, Zurich.
Banque de Paris et des Pays Bas.	

The board of directors of the company, whose headquarters are at the premises of the Swiss Credit Anstalt, Zurich, comprises representatives of the banks mentioned, and includes the names of W. C. Escher, of Zurich, and Dr. Walther Rathenau, of Berlin. It will be seen that whilst French, German, Belgian, Swiss and Austrian capital is represented by the promoters, the participation of English interests, contrary to former reports, finds no part in the undertaking.

Anglo-Russian Trade.—We have received a copy of the *Anglo-Russian Gazette*, a new 3d. paper which contains a good deal of matter of interest to those who are concerned with the development of trading relations between England and Russia. The publishing offices are at Salisbury House, E.C.

Our Trade in Canada.—In a recent article we commented upon the imperative necessity of devoting greater attention to the fostering of electrical trade between this country and Canada, and we quoted the views expressed to us by a Canadian electrical engineer who recently paid a visit to this country. In order that the matter may not be lost sight of, and to lend support to the comments that we and others have made at different times, we quote the following extracts from an article "by a Canadian expert" appearing in the *Daily Mail* of Friday last. The titles of the are, "Canada's Trade; Indictment of our Manufacturers; 'Common Cause' of Failure." The author writes:—

"The common cause of the comparatively low standing of British imports into Canada is the indifference of the British manufacturer. The merits of the British-made article are recognised by the Canadian people. It is preferred to the foreign, and we have given practical evidence of our preference by admitting British goods at 33⅓ per cent. less duty than the goods of any other country.

"But if the British-made article were a hundred times more meritorious, and if the people of Canada were 100 times more eager to buy it, results could not follow without the necessary initiative on the part of the British manufacturer. The purchaser, in these days of strenuous competition, will not go to the seller, and that, in sharp contrast to the methods of the United States merchant, is what the British manufacturer seems to expect the Canadian purchaser to do.

"Few commercial travellers for British houses are to be met in Canada. There is but a feeble effort on the part of the British merchant to get in touch with his Canadian customer. His catalogues contain price lists in pounds, shillings and pence, which nullify their value to a large majority of the people they reach. In what little advertising the British merchant does in Canada, there is, in many instances, the same careless disregard of modern business methods.

"Great Britain has held her own in Australia and South Africa, as the trade returns prove. The British manufacturer has not held his own in Canada. I venture to say that if he had shown the same languid interest in the African and Australasian markets that he has so long shown in the Dominion, the outcome in these places would have been the same.

"When I was in Montreal a few weeks ago I talked with an advertising manager who is associated with one of Canada's largest firms.

"'There are advertisements,' he said, 'that have been running without a change of copy for 25 years. I know of one advertisement in a leading Toronto paper which I can remember as a boy. It is still there without a solitary change, with its ancient cut and ancient wording.'

"Though I have made the closest inquiries among business men, I have yet to learn of a British manufacturer who, having put forth the necessary initiative in Canada, has failed to secure his share of Canadian patronage.

"Mr. Grigg, the British Trade Commissioner, who made intelligent study of trade conditions in our land, gave four reasons for Great Britain's unfavourable showing in Dominion trade:—

"1. Lack of commercial agents in Canada.

"2. Geographical position of the Dominion.

"3. Inability of the British manufacturer to adapt goods to to Canadian requirements.

"4. Indifference of British merchants to the Canadian market.

"In my opinion the fourth factor should be mentioned first. If the British manufacturer woke up and studied our market, he would rapidly repeat the success he has so constantly won in the other parts of the Empire."

Curtis Steam Turbines.—The following is a list of orders that have been received by the BRITISH THOMSON-HOUSTON CO., LTD., for Curtis turbines of the horizontal type for exhaust and mixed pressure:—

Cleveland & Durham E.P. Co. (Teesbridge).—One 1,500-KW. two-stage plain exhaust three-phase alternator.
Fife Coal Co.—Two 750-KW. three-phase mixed pressure.
Earl Fitzwilliam Collieries.—One 350-KW. mixed pressure A.C.
Wath Main Colliery.—One 500-KW. plain exhaust A.C.
Braidwater Spinning Co., Ireland.—One 750-KW. mixed pressure A.C.
Bolsover Colliery Co.—One 500-KW. A.C. plain exhaust.
Lothian Coal Co.—One 560-KW. mixed pressure D.C.
Shirebrook Colliery Co.—One 500-KW. mixed pressure A.C.
Bolckow, Vaughan.—One 750-KW mixed pressure A.C.
Carrongrove Paper Co.—One 1,000-KW. high pressure A.C.
Oriental Timber Co.—One 750-KW. mixed pressure A.C.
Watford U.D.C.—One 500-KW. high pressure A.C.
Hakota E.L. Co.—One 1,000-KW. high pressure A.C.

It may be added that repeat orders for vertical Curtis steam turbines have been received from the Liverpool Corporation for its Lister Drive station, where three vertical Curtis steam turbines are installed and giving satisfaction, and that five vertical Curtis steam turbines are installed at the County of London Electric Supply Co.'s stations.

Exhibition.—Another scientific Exhibition, on similar lines to that which proved so successful in 1907, is to be held at the Royal Horticultural Hall, Westminster, S.W., in October next. The exhibits will include engineering models, electrical and scientific apparatus, lathes and light workshop appliances, model aeroplanes, and technical education equipment. A number of firms have already taken space, and a very interesting display is assured. An attractive feature will be the exhibits in the competitions for model and scientific apparatus making, several events for both amateur and professional workers having been arranged, for which prizes are being offered. Full particulars may be obtained from the organisers, MESSRS. PERCIVAL MARSHALL & Co., 26-29, Poppin's Court, Fleet Street, London, E.C.

Electricity at the Golden West, Earl's Court.—There is not a great deal which is of special interest to electrical engineers at the Golden West, but there are one or two things which attracted our attention during a recent visit. One of these was the automatic telephone exchange exhibited by the AUTOMATIC ELECTRIC CO., which is, we think, worthy of notice. The use of automatic telephone exchanges would be limited in this country to private installations. The intercommunication system is useful up to a certain point, beyond which an exchange becomes necessary, and this, of course, involves the expense of an exchange attendant. The exchange attendant introduces the time element, that is to say, there is always a certain amount of time lost in ringing up the exchange, giving her the number and then waiting for her to call up the number, make the necessary through connection, and advise subscribers that they are connected. The automatic system reduces this to a minimum, the time required being very little more than in the intercommunication system. In the latter all one has to do is to press one button or move a lever to the required number, and then use the instrument. In the automatic system the only difference is that one or two seconds more are taken up in moving the lever once for each digit of the subscriber's number. During our visit the operator rang up some half-dozen people in about half a minute, whereas with the manually-operated exchange system one would be fortunate to get one call through in twice the time. If one rings up an engaged subscriber, the engaged signal is automatically given; if an instrument is out of order a distinctive signal is also given. In fact, the automatic system appears to do everything that the ordinary "Hello girl" accomplishes, and does it silently and more expeditiously. Another interesting feature is the side show of X-ray apparatus in charge of Mr. Dean, who is one of the pioneers who have suffered in the cause of X-ray science. He shows the most up-to-date apparatus in radiography, including the safety screens which are now used by operators. He claims that by means of the apparatus he exhibits the operator is quite immune from harmful effects. There are several other interesting exhibits in the way of tools and engineering apparatus generally.

Athletics.—The second annual athletic meeting of the various Vickers, Sons & Maxim's works was held at the Vicker's Sports Club Ground, Carbrook, Sheffield, on Saturday afternoon, July 10th, teams from the following works taking part:—Vickers, Sons & Maxim, Sheffield, Barrow-in-Furness, Erith and London Office; the Wolseley Tool and Motor-Car Co., Ltd., Birmingham; and the Electric and Ordnance Accessories Co., Ltd., Birmingham. Prizes to the total of £60 were offered, and in addition a 30-guinea silver challenge cup was competed for, to be held for one year by the works whose representatives secured the highest number of points. In addition to those for employés only, there were several open events, including two for local school children. The holders of the challenge cup for the ensuing year are the Barrow Works of Messrs. Vickers, Sons & Maxim, who sent up a contingent of splendid athletes, and secured three first, three seconds, and two thirds, making a total of 17 points out of a possible 36. Considering that only seven men were present from Barrow, this is a very meritorious performance. The winners of the cup last year were the Electric and Ordnance Accessories Co., Ltd., Birmingham. The Master Cutler, Mr. Douglas Vickers, was present during the afternoon, and presented the prizes and challenge cup to the successful competitors.

Trade Announcements.—MESSRS. STOODLEY BROS., electrical engineers, have opened new business premises at The Arcade, Aldershot.

MESSRS. W. T. GLOVER & CO., LTD., of Trafford Park, Manchester, inform us that they have appointed Messrs. Haslam and Schontheil, of Western Mail Chambers, Cardiff, to represent them in South Wales, for the supply of electrical wires, cables and accessories.

MESSRS. GILLESPIE & BEALES, of Amberley House, Norfolk Street, Strand, have been appointed selling agents for the Bastian electric heating and cooking devices, which were described in our last issue.

MR. J. LAMBIE, in conjunction with MR. C. R. WRIGLEY, late of Laurence, Scott & Co., Ltd., of Norwich, are taking over the London contracting business of the Walsall Electrical Co., Ltd., at 116, City Road. Messrs. Lambie & Wrigley will also represent the Wallsall Electrical Co, Ltd., for their various manufactures, including all classes of switchboards and measuring instruments. The telephone number remains unaltered, viz., 8,841, London Wall.

THE BRITISH OIL CO. have removed to Norfolk House, Lawrence Pountney Hill, E.C.

On and after the 15th inst., the address of the Newcastle office of the UNION ELECTRIC CO., LTD., will be Collingwood Buildings, Newcastle-on-Tyne.

Mexico.—According to the *Mexican Herald* a company, to be known as the Mexico Steel and Chemical Co., has been formed, with a capital of $1,000,000 (about £102,000), to manufacture steel and chemical products by the use of electrical power. Work is soon to be begun on the plant, which it is hoped will be completed within a year. It is intended to manufacture, among other things, rails, steel castings, shoes and dies for mining mills, and calcium carbide.—*Board of Trade Journal.*

South African Exhibition.—H.M. Trade Commissioner for South Africa (Mr. R. Sothern Holland) now reports that it has been decided to hold, instead of an international exhibition, a South African exhibition on a large scale; it will include an international show of agricultural implements and machinery, electrical appliances, motor cars, &c.

Catalogues and Lists.—MR. JENS ORTEN-BÖVING, 72 74, Victoria Street, Westminster, S.W.—32-page catalogue (No. 27E) containing well-illustrated particulars and prices of Dr. Horn's patent tachometers for launch, turbine, tramway, locomotive and other service, also tachographs, engine counters, and electrical counters for distance operation. We understand that five special turbine tachometers are being installed on the turbines for the Westminster Electric Supply Corporation. In all probability, these tachometers will shortly be manufactured under licence in England.

MESSRS. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Blomfield Street, London Wall, E.C.—New list (32 pages) containing particulars, with prices, of jointing tapes, compounds, jointers' tents, tool-boxes and tools, safety lamps and accessories. It sets out in convenient form particulars of a large variety of insulating and other tapes. It describes their various properties and the purposes for which they are best suited, with particulars as to the prices, widths, weights, &c.—information likely to be of service to tramway engineers, mains superintendents, mining engineers and electrical contractors.

UNION ELECTRIC CO., LTD., Park Street, Southwark, S.E.—List No. 6,020, of about 30 pages, dealing fully with their "Fortiter" direct-current motor-starting switches, controllers and resistance apparatus. Tabulated data, with illustrations and prices, are given, also diagrams of connections and dimension sketches. A number of special devices to which attention may be called are: Motor-starters with oil-cooled resistances, with field-reversing switches, and with step-by-step slow action, also standard speed regulators without automatic features, and motor-starters of the multiple-solenoid type.

MESSRS. ARNOLD GOODWIN & SON, LTD., Sumner Street, Southwark Bridge, S.E.—Several leaflets relating to their runways, lifting blocks, the "Beatall" system of raising water by compressed air, also their pulleys, shafting, gearing, &c.

ADAMS MANUFACTURING CO., LTD., Bedford.—Large collection of illustrated lists in binding cover, describing some of their Standard types of "Igranic" motor starting and controlling apparatus for alternating and direct-current duty. It is difficult to know where to begin in trying to indicate the contents of these lists, for they cover such a variety of manufactures, starting with rheostats of heavy duty type, fool-proof motor starting rheostats, automatic solenoid pump starting rheostats, rheostats for large motors, for air compressors, capstans, winches, and for slip-ring three-phase induction motors; self-acting motor starting switches, compound starting and speed regulating rheostats for shunt or compound-wound motors for machine tools; shunt field regulators, motor-speed regulators, controllers for organ blowing, reversible lift controllers, and controllers for rotary printing machines. All these and many more classes of "Igranic" apparatus are illustrated and described, lists of prices and dimensional particulars being also given.

MESSRS. COWANS, LTD., Springfield Lane, Salford.—Twenty odd leaflets (caught in a red-covered binder) neatly illustrating on art paper a number of the firm's manufactures, commencing with the Cowan-Still regulating transformers, and proceeding with resistances, generator rheostats, spring-break switches, house service and motor switches, switch fuses, field-breaking switches, service-joint boxes, Andrews's patent current direction indicator, oil and other circuit breakers, overload relays, and other things, concluding with current transformers.

MESSRS. TETLEY & CO., Falcon Electrical Works, Salford.—Price list No. 30, relating to the "Falcon" liquid motor starters and control panels of D.C. and polyphase slip-ring motors; also leaflet showing and pricing the "Poland" knife type ironclad double-break switches for motor circuits up to 600 volts.

MESSRS. ALFRED HERBERT, LTD., Coventry.—Catalogue Section C 3, describing their Universal grinding machine (12 in. × 36 in.).

BRITISH INSULATED AND HELSBY CABLES, LTD., Prescot.—Leaflet (P 102), tabulating sizes, &c., of Prescot braided aerial cables and wires impregnated with a special weather-proof compound.

THE ALBANY ENGINEERING CO., Ossory Road, Old Kent Road, S.E.—A number of current lists of their "Albany" water-sealed rotary pumps, improved pattern electrically-driven pumps, high-lift centrifugal pumps, electrically-driven "Blizzard" fans, small power motors, &c. We learn that the company has been recommended for the highest award (Diploma and Gold Medal) at the 1909 International Exhibition, Paris, for its "Albany" patent rotary (water-sealed) pumps.

MESSRS. W. T. GLOVER & CO., LTD., Trafford Park, Manchester.—Glover's eighth almanac, for the ensuing 12 months, has come to hand. As usual, it contains numerous items of useful technical information from various sources, relieved by not a few humorous illustrations and allusions to the lighter side of things.

MESSRS. GEO. M'CARTNEY & CO., Burnside Works, Cumnock, N.B.—Loose lists giving prices and particulars of their "J" type switch, and the "E" type double-pole main switch.

MESSRS. T. W. BROADBENT, LTD., East Parade, Huddersfield.—Leaflet relating to their N-type single-phase motors and P type motor-starters. It is claimed that a reduction of the starting current required by these motors has been obtained by means of more effective "phase-splitting." The firm reports a continuance of good trade, and sends us a list of a number of contracts for electric generators, motors, switchboards, &c., received during the last few weeks.

MESSRS. ALEX. TURNBULL & CO., LTD., St. Mungo Works, Bishopbriggs, Glasgow.—Coloured wall sheet showing a large illustration, in section, of their patent "Excelsior" full-bore parallel slide sluice valve. The valve embodies a number of special features which are detailed on the sheet; copies of the latter will be forwarded to any reader on application.

Book Notices.—*Electricity in Factories and Workshops* By A. P. Haslam. London: Crosby Lockwood & Sons. Price 7s. 6d. net.—The author has made an attempt to produce a book which shall be useful to electric power users, whether the power be taken from the public supply or produced on the premises. The book is divided into three sections, the first dealing with the electric motor and its accessories, in which both D.C. and A.C. motors, together with their starting gear, are very clearly set forth, the advantages of each type of apparatus being carefully described. Section 2 deals with the provision of electrical energy, and the author explains fully how the cost of energy is affected by the conditions of working, and thoroughly discusses the meaning of "load factor," "diversity factor," &c., showing how these affect the cost of supply. The bearing of the questions are made clear by worked-out examples under different conditions. The "maximum demand" system is treated in the same way, although, as the author points out, this system has never been satisfactory and is gradually going out of use. Comparisons are also made in this section between the cost of power by electric motors and gas engines for the small power user. In the third section, the author deals with the applications of electric power, chapters being devoted to textile factories, printing works and engineering shops, the special requirements being thoroughly discussed. The bearing of the Home Office regulations on power installations is also gone into, and in the final chapter we have a good deal of valuable information on the lighting of industrial establishments. The author has done his work very conscientiously, and the reader may rest assured that any information given in the book is accurate and reliable.

Rules for Recovering Coal Mines after Explosions and Fires. By W. E. Garforth. London: Chichester Press. 1909. Price 3s. 6d. net.—In this novel work the author embodies the results of his experience in the subject indicated by the title, with a detailed description of the recovery of the Altofts Pit, in accordance with these rules—most of which, he points out, are intended as reminders rather than rules. The importance of having a plan "cut and dried" for use in such an emergency as the explosion of a coal mine, where the lives of hundreds of men depend upon the promptitude and resourcefulness of the officials, needs no demonstration, and this unique little handbook will be of untold value at such times—though that it may rarely be needed is, we are certain, the sincere wish of the author. As regards electrical matters, the book has little to say; no doubt at such a time all electric circuits within range of the disaster would be utterly disorganised and useless. The author recommends that a supply of portable electric lamps be kept in constant readiness, in addition to the ordinary safety lamps; he mentions also the immense value of a portable telephone with a cable and reel for connecting an exploring party with the surface.

"Thoughts on Natural Philosophy and the Origin of Life." By A. Biddlecombe. Newcastle-upon-Tyne: R. Ward & Sons. 1909. Price 2s. 6d.

"The I.C.S. Student." Souvenir Number. July, 1909. London: From the I.C.S.

"Proceedings of the American Society of Civil Engineers." Vol. XXXV. No. 5. May, 1909. New York: The Society.

"Memoirs of the College of Science and Engineering, Kyoto Imperial University." Vol. I. No. 4. 1908. Kyoto: The University.

Bankruptcy Proceedings.—W. T. HARRIS (W. T. Harris & Sons), electrical engineer, Commercial Road, Portsmouth.—The receiving order in this case was made on debtor's petition, and the statement of accounts shows gross liabilities £3,883, of which £678 is unsecured, and assets, after allowing £55 for preference claims, estimated at £844, thus showing an estimated surplus of £166 odd. The debtor was formerly in the Navy, and started business in 1899, when his capital amounted to about £700. He cannot state what his profits have been. He attributes his failure to heavy expenses and bad debts. The secured creditors are the first and second mortgages of 460, 462 and 464, Commercial Road, £1,200 and £600 respectively, and the mortgages of 47, Emanuel Street, £1,350, the properties being valued at the same amounts. The debtor further states that he has not been sued for debt during the 10 years of his trading, and that if the estate could be realised as a going concern he is now solvent. The first meeting is called for July 19th; and the public examination for July 26th—both at Portsmouth.

Dissolutions and Liquidations.—BRITISH ALUMINIUM CO., LTD.—A petition presented by Messrs. A. Schonfield and Herman Kuttner, of Glasgow, creditors, for the winding up of this company, is to be heard in London on July 20th.

VANADIUM CO., LTD.—A meeting is to be held at 9-10, Fenchurch Street, E.C., on August 11th, to receive the report of the liquidator (Mr. T. A. Ward).

CHIPPING NORTON ELECTRIC LIGHT AND POWER CO., LTD.—A meeting is to be held at 1, West Street, Finsbury, on August 11th, to hear the report of the liquidator (Mr. A. Barlow).

GUNBIE, REES & CO., gas and electrical engineers, 7, Finsbury Square, E.C.—Messrs. F. G. Gunbie and F. H. Rees have dissolved partnership. Mr. Rees will attend to debts.

ADOS, LTD., Lincoln.—This company is winding up voluntarily. A meeting of creditors is to be held at Francis Court, Lincoln, on July 20th. Mr. J. S. Streets, Royal Insurance Buildings, Lincoln is liquidator. The total liabilities, exclusive of shareholders, is £165, and the estimated value of the assets is £260.

Annual Outings.—The members of the Osram and Robertson Social and Athletic Club had their first annual outing to Hastings on Saturday, July 3rd. Some 550 members left by special train from Addison Road, and arrived in Hastings about 11 o'clock. The staff had luncheon at the Waverley Hotel, with Mr. C. Wilson (manager) in the chair, and this was followed by a drive to Battle. Amongst the visitors were Mr. Davey (chairman, Assn. Engineers-in-Charge), Mr. S. D. White (G.E.C., London), and Dr. Levey (D.G.A., Berlin).

Mr. J. H. Heathman, of ladder fame, not finding a sufficient outlet for his superabundant energy in devising new forms of ingenious ladders and fire appliances, finds time to organise a series of launch trips on the Thames to which his numerous friends and customers turn out with unfailing enthusiasm. On Saturday last the trip was combined with the annual outing of the staff, and a company of nearly a hundred spent an enjoyable day in a run from Kingston to Windsor and back, luncheon and tea being served on board, and sufficient time being allowed at Windsor for a short visit to the Castle. Both on the outward and return journey the time was beguiled with an excellent programme of music, to which several of the friends and staff contributed. The few speeches on the return journey bore evidence to an excellent understanding between Mr. Heathman and his staff, and the desire to work heartily together to ensure the continued prosperity of the firm.

The third annual outing and sports of the Marylebone Electricity Department took place last Saturday week. The party, considerably over 100 strong, spent the day at Brighton. The annual sports took place in Preston Park. Some of the party visited the Brighton Electricity Works. At the dinner, Mr. G. Parr proposed "The St. Marylebone Electricity Undertaking," and Mr. Smyth replied. Mr. A. H. Seabrook, the newly-appointed engineer, was unable to be present.

The eighth annual outing of the Bromley Electric Light and Power Co., Ltd., was held at Brighton last Saturday week.

Fire in Moscow.—Reuter reports that on the 10th inst. a fire broke out in the premises of the Russian Westinghouse Co. at Moscow and caused damage estimated at £10,000.

LIGHTING and POWER NOTES.

Ayrshire.—At a meeting of the Northern District Committee of Ayrshire C.C., intimation was given by the Skelmorlie Electrical Supply Co. that it intends to apply to the B. of T. for a prov. order to authorise the company to supply Skelmorlie and district with electric light.

Bath.—The T.C. has decided to apply for a prov. order for E.L. in the area of the R.D.C., and a similar application is being made by the Western Electrical Construction Co.

The Corporation has notified its intention of applying for a prov. order, in view of numerous applications received for a supply. As the District Council's own prov. order has not yet lapsed, it was suggested at a meeting of the latter body that the city should be approached with a view to its taking over the existing order.

Beckenham.—The U.D.C. has decided that an endeavour should be made, in co-operation with the wiring contractors, to arrange a better system of advertising the free-wiring scheme. A suggestion that a show-room should be opened in connection with the E.L. undertaking has not been entertained by the Council.

Bristol.—The accounts of the city electricity undertaking, recently published, show that the department has suffered not only from the prevailing complaints of trade depression and "metalitis," but also from the necessity of using the older Temple Back generating plant owing to the unsatisfactory state of recent turbine plant at Avonbank, whereby working costs were adversely affected. The total units sold were 8,110,957, including 822,362 units for public lighting, and the balance for lighting and power. It is satisfactory to note, moreover, that the aggregate H.P. of motors and heating has increased from 7,103 to 10,179 during the 12 months. The gross receipts amounted to £81,390, and expenditure to £38,226, leaving a gross profit of £43,164, which, with certain additions, gave £45,821 to meet financial charges amounting to £46,126, leaving a deficiency of £305 on the year's working. Mr. H. Faraday Proctor pointed out that restricted lighting consumption may be anticipated during the present year, after which he looks forward to a steady increase in consumption for all purposes. The department has earned a balance of £24,741 net profit in previous years, and some £18,306 remains to the credit of the reserve fund.

Buxton.—The U.D.C. has decided to reduce the cost of energy for power and heating to 2½d. per unit for one hour's use of the maximum demand per day, and 1½d. per unit beyond; 2½d. per unit for 300 units per quarter; 1½d. per unit between 300 and 450 units per quarter; and 1½d. per unit beyond.

Continental Notes.—European Water-Powers.—The following figures are given by *l'Elettricita*, Milan:—France has available hydraulic power totalling 4,500,000 H.P.; Italy is using at the present time nearly 350,000 H.P.; Switzerland is using about 300,000 H.P.; Germany is using about 100,000 H.P., out of an available 700,000 H.P.; Russia probably has 11,000,000 H.P. available, of which only 85,000 are at present used.

Italy.—The Anglo-Romana Co. for the illumination of Rome reports that during 1908 a total of 27,053,145 units were sold, made up as follows:—Lighting, 7,611,463; traction, 9,063,585; motive power, 10,357,440; heating, 20,658, this total being about 10 per cent. more than during the previous year. The total number of arc lamps connected is 2,118, and incandescent lamps 308,458. There are over 5,000 motors on the mains, the average size being about 5½ H.P. The network now comprises 216,387 m. of high pressure and 102,831 m. of low pressure mains, all underground.

Clacton-on-Sea.—The U.D.C. has decided to apply to the L.G.B. for a loan of £630 for electricity purposes.

Cowdenbeath (Fife).—At a meeting of the T.C. a requisition by the Fife Electric Power Co. as to the granting of a provisional order for the sale of electricity in the town was discussed. It was agreed to instruct the Council's legal adviser to intimate to the company that it refused to give consent, and it was suggested that the Council take the necessary steps to obtain a provisional order itself.

East Ham.—Upon the recommendation of the electrical engineer and manager, the Lighting Committee has arranged reductions for power consumers. The revised scale is as follows:—Not exceeding 150 units per quarter, 2d. per unit; from 150 to 1,000, 1½d.; from 1,000 to 6,000, 1¼d., subject to 5 per cent. discount for prompt payment. Special terms will be arranged for consumers who guarantee over 6,000 units consumption per quarter.

Gillingham (Kent).—In sanctioning a loan of £2,804 for electricity purposes, this being a part of £5,000 applied for, the L.G.B. has advised the T.C. to engage a highly-qualified electrical engineer to investigate the working of the undertaking and report upon the best means to reduce the annual loss incurred. The Council has adopted this suggestion.

Glasgow.—At a meeting of Parish Council, it was reported that as the result of various inquiries made of the Clyde Valley Electrical Power Co., in explanation of the original offer, the master of works has submitted a detailed report as to the suggested electrical supply to the Goatloch Asylum by that company. As the report indicated clearly that the saving, if any, which might result from the transference of the supply would be infinitesimal, while considerable expense, estimated at £1,159, would be incurred at the outset in adapting the plant to suit the altered conditions, the Sub-Committee unanimously resolved that the supply be continued from the existing installation at the asylum.

Hereford.—The T.C. has received from the L.G.B. sanction to a loan of £7,038 for electricity purposes, made up as follows:—£1,190 excess expenditure on buildings, plant and machinery; £648 excess expenditure on cables, services and meters; £1,500 for new services; and £3,700 for water cooling plant, &c.

Keynsham.—The P.C. has accepted the tender of the E.L. Co. for public lighting for a year at £260 15s.

Leyton.—The Council has agreed to a suggestion of the electrical engineer to give a three months' trial to arc lamps by Johnson & Phillips, Jandus Arc Lamp Co., Crompton & Co., and the Oliver Arc Lamp Co., in connection with the public lighting scheme. In view of the increased number of metal-filament lamps available, the electrical engineer has obtained a reduction in the price of Osram lamps from 40s. to 30s. 3d. per doz.

London.—Battersea.—On June 9th the Council decided to apply to the L.C.C. for a loan of £1,500 for providing consumers with arc lamps and motors, and wiring premises therefor on the cash and hire-purchase systems. As it appears to the Lighting Committee that to await the sanction of the central authority would probably cause delay, £100 is to be taken out of current revenue to inaugurate the scheme.

Fulham.—Additional condensing plant (pump, piping, &c.), costing £160, is to be installed at the electricity works.

Longton.—The annual report of the Electricity Committee states that the total number of units generated during the past year was 273,401, an increase on the preceding year of 71,817, or 35·6 per cent. The increase in current used both for lighting and motive power showed that electricity was making rapid headway, and additional generating plant would have to be put in before the winter, and an extension made to the station. The extensions proposed would double the capacity of the works. The gross profits for the past year amounted to £1,634, and the net profit to £101.

Ludlow.—Messrs. Foote & Milne have informed the T.C. that they intend applying for a prov. order for E.L.

Market Harborough.—The B. of T. has deferred the question of revoking the E.L. order of the U.D.C. for a year from June 22nd.

West Ham.—An agreement has been entered into with the Poplar Guardians to supply energy to the branch workhouse in Forest Lane for five years. The Electricity Committee has arranged to include in its orders on the present contractors the Osram lamps required for the Marylebone B.C.

Motherwell.—In submitting the annual statement of the accounts of the Electricity Department to the T.C. for approval, Mr. M. Kendrick pointed out that the balance-sheet showed the gross profit to amount to £5,931, and the net profit, after deducting payment of interest and sinking fund, to amount to £229. The year's working, he explained, had undoubtedly been affected by the general bad trade of the year. He drew attention to the fact that the works were not meant to be carried on as a money-making concern.

Nailsworth.—The Gloucestershire E.P. Co. is applying for a prov. order for electric lighting in the area of the U.D.C.

Newport (Mon.).—The E.L. Committee of the T.C. has decided to replace 230 gas lamps with Osram electric lamps. The charge for the lamps is to be £2 each per annum.

Newton-in-Makerfield.—The B. of T. has informed the U.D.C. that the electric lighting order has been revoked as from May 25th.

Oldham.—The published report of the electricity department for the year ending March last shows a considerable financial improvement over the previous 12 months, the net profit being £3,451, as against £1,724 in 1907-8. During the year some 16 million units were sold, including 1,692,240 for private use, 21,827 for public lighting and 4,325,972 for traction. The maximum load reached 3,178 KW., load factor 21·73 per cent., and total cost ·910d. per unit. It is satisfactory to note that the private motor load advanced from 376,813 to 570,897 units during the year, although the latter amount is an insignificant quantity for an industrial centre such as Oldham.

Petersfield.—The Petersfield Electricity Supply Co. has informed the R.D.C. that it intends applying for a prov. order for E.L. for the parishes of Liss, Sheet and Steep.

Portugal.—The staff of the electricity works at Oporto has decided to strike, with a view to obtaining increased wages.

Runcorn.—Mr. G. H. Cox and Mr. H. J. Falk, of the Salt Union, have given notice of their intention to apply for a prov. order for electric supply within the urban district.

Sandwich.—The T.C. has been informed that a prov. order for E.L. is being applied for by Mr. Mark Parker, of 3, East Cliffe, Dover.

St. Helens.—The T.C. has applied to the B. of T. for consent to a supply of energy being given to the Sutton district, on a three-phase H.T. system at 6,000 volts pressure, and a loan of £8,000 for the necessary plant and cable has also been applied for.

Sheffield.—The annual report of the electric supply department, shows a total income of £77,728, and a gross profit of £52,702. Financial charges bring the surplus down to £2,423. The latter sum, together with the accumulated surplus of previous years, make a total of £18,752, from which £10,000 has been transferred to a renewals fund, and the balance of £8,752, the manager, Mr. S. E. Fedden, recommends should remain as an available surplus to meet a possible deficiency next March, owing to the effect of the metallic-filament lamp in reducing sales for the time being. Mr. Fedden points out that there has been a fall in revenue of £4,251 on lighting, although there had been an increased number of new consumers; the increase in motor energy had been well maintained in view of local trade depression.

The T.C. has decided to apply for a loan of £56,000 for electricity purposes.

Southport.—The result of the past year's working of the electricity department, was a total revenue of £25,350, and a gross profit of £15,054; the net result was a surplus of £3,005. The full effect of the new lamps was not experienced until the latter half of the year when there was a decrease of 18,631 units supplied for lighting, as compared with the previous year's return.

Stroud (Glos.).—The Gloucestershire Electric Power Syndicate, Ltd., has informed the U.D.C. that it intends applying for a prov. order for E.L.

Stockton-on-Tees.—Some discussion has taken place on the recommendation of the Electricity Committee to continue to supply Messrs. Head Wrightson & Co. for a further five years at a lower price than previously. In reply to the argument that the price was too low, it was shown that since commencing this supply five years ago, the cost of production had fallen from 2·10d. to 1·31d. per unit, and that a loss on working had been turned into a profit. The price quoted was ¾d. per unit, and the load was purely a day load, which if refused would reduce the electricity output by one-third.

Swansea.—At the meeting of the Electric Lighting Committee on Wednesday last, a letter was read from Mr. Edward Harris, on behalf of certain clients, requesting an appointment to discuss a scheme to transfer the Council's electricity undertaking to a company, which would become responsible for the financial charges, and would agree to extend the supply and reduce prices. The company expected that the reduced prices would appeal to a number of local industries, and would check the tendency to go in for private plants, &c. After a long discussion, the Committee decided not to entertain the offer.

Sutton.—The South Metropolitan Electric Tramways and Lighting Co. has given notice of a proposed increased charge for energy in October next. The matter was discussed at the last meeting of the District Council, when it was stated that at present the careful householder could have his lighting at practically a flat rate of 3¼d., whereas now it was intended to raise this charge by something like 60 per cent. Mr. Jackson, as chairman of the General Purposes Committee, stated that he had had numerous letters from residents drawing attention to the matter. The clerk was asked to look into the powers of the company under its order.

Taunton.—At the T.C. meeting on the 13th inst., the report and accounts of the Electricity Committee for the past year were adopted. The electricity department showed a gross profit of £4,138 and a net surplus of £19 after carrying forward £46 to reserve.

Transvaal.—In his evidence before the Electric Power Commission, Prof. Klingenberg, consulting engineer to the Victoria Falls Co., said that the capital of the company was being provided as to 63 per cent. by Germany and the remainder in England; 40 per cent. of the expenditure went in orders to Germany, and up to the present 11 per cent. to England, leaving, roughly, 43 per cent. for freight and erection. Mr. Gilfillan, one of the solicitors for the Vereeniging Estates, gave evidence that there was no hostility on the part of the agricultural interests through whose land the transmission would pass; there was a demand for electricity for pumping, lighting and general power purposes on the farms, and it would facilitate both irrigation and ploughing.

Walsall.—The Electricity Committee has recommended the T.C. to apply for a loan of £35,000 for extensions to the plant and electricity works.

Whitefield.—The B. of T. has approved of the transfer of the E.L. order of the U.D.C. to the Lancashire Electric Power Co.

Wimbledon.—Negotiations are proceeding with the Maldens and Coombe U.D.C. with regard to a supply of energy to that district. A notice is to be served that Wimbledon is to apply to the B. of T. for a prov. order to supply electricity to Maldens and Coombe.

Worthing.—On the understanding that the annual consumption will amount to 10,000 units, the T.C. has agreed to supply energy to the Theatre Royal for lighting purposes at a special rate of 3d. per unit.

Wolverhampton.—The Corporation Electricity Committee has recommended that a loan of £10,000 be applied for for mains extensions.

The result of the year 1908-9 as regards the electricity department, was a gross profit of £16,892, and after meeting financial charges, a surplus of £3,401. The receipts show an increase of £5,551 on the year's work, attributable to new power consumers; at March last 5,338 B.H.P. of motors were connected, representing an addition of 3,203 H.P. during the year, when H.T. feeders were run to the works of the Chillington Tool Co., Thomas Parker, Ltd., Electric Construction Co., and Chubb & Son's new works. During the year 6,555,125 units were sold, as compared with 4,554,457 in the previous year, the quantity sold for traction being 1½ million units practically in both years; the works costs were ·521d., and the total costs ·682d. per unit sold.

TRAMWAY and RAILWAY NOTES.

Bournemouth.—A lengthy report of the Tramways Committee came before the T.C. on the 6th inst., which included an estimate by the general manager that £33,000 will be required for permanent way renewals, apart from ordinary maintenance, during the next four years. Improvements are being carried out in the matters of brakes, controllers, ploughs, &c., and arrangements are to be made for setting up a training school for motormen and conductors.

Bury.—The annual report of the working of the Corporation tramways for the year ended March 31st, just issued, states that the expenditure on repairs and maintenance of permanent way, compared with the previous year, showed an increase of 20 per cent., the total being £1,330. The expenditure on overhead equipment and cables had been £659, practically double the amount of the previous year. The gross traffic receipts had been £58,929, an increase of £1,630. The number of passengers carried had been 7,265,909, equal to the estimated population of the district being carried 100 times. The working expenses were 4·112d. per car-mile, exclusive of power, and the total working expenses were 5·833d. per car-mile. The financial statement showed a net surplus of £3,120.

Continental Notes.—SWITZERLAND.—A decree has been granted for an 80 years' concession for the construction and working of a single-track metre-gauge electric railway from Berne to Zollikofen, with a branch from the Tiefenau bridge to Worblaufen. The total cost of the undertaking is estimated at £26,000. Another 80 years' concession has been granted for the construction and working of a single-track metre-gauge electric railway from Goppenstein to Blatten. The total cost of the latter undertaking is estimated at £50,000.

Halifax.—The total revenue of the tramways department during the year ended March last amounted to £86,158, and the gross profit amounted to £26,013, against £19,337 for the previous 12 months. Special expenditure of £17,982 for accident compensation, and on track and equipment, in addition to the ordinary financial charges, more than absorbed this surplus, leaving a loss on the year of £13,542, as compared with a loss of £9,605 in the previous year. Some 16,413,434 passengers were carried during the 12 months.

Hastings.—Owing to the bad weather of the past six months the tramway receipts have fallen £800 compared with the same period last year. In intimating to the preference shareholders that they are not in a position to pay any interim dividend, the directors of the Tramways Co. state that the measures taken for the reduction of expenses, foreshadowed at the last general meeting, have not had time to become effective. With fine weather during the next few months it is hoped to make good the falling off in gross revenue.

Heywood.—Considerable discussion took place on the 8th inst., at the meeting of the T.C., with regard to the new agreement with Bury and Rochdale in relation to the running of cars between the three towns. Councillor Popple said that in the new agreement they would get all they desired. All the Corporations would have running powers into each other's boroughs, but Heywood did not propose to run its own cars, but would allow Bury and Rochdale to do so for it. The Corporations would take the whole of the fares collected, and the cost of working would be that actually incurred. It was decided to seal the agreement. The Mayor said Rochdale T.C. had already sealed the agreement, and the Bury Corporation would do so on Monday. On Tuesday the agreement was to come before the House of Commons' Committee for confirmation.

Peterborough.—Following the complaints by the Corporation and ratepayers generally, Col. Druitt, of the B. of T., has made an inspection of the track of the Peterborough Electric Traction Co., Ltd., and has reported favourably to the company. He states that though some repairs are necessary, yet the company has not made default in the maintenance within the meaning of Sec. 26 of the 1900 Light Railway Order. The Corporation gave the report a hostile reception, and decided to approach the County Council with a view to joint action.

Salford.—The overturning of an overhead equipment repair "tower" owned by the Corporation Tramways Department, on Sunday last, resulted in a serious accident. Four men were on the tower in Bolton Road, Pendleton, and they were all thrown to the ground. John Roberts (45), the foreman, sustained a fractured skull, and died the following day in the Salford Hospital. The other men received severe injuries, one having a broken ankle, and one having several ribs fractured.

South Shields.—A joint meeting of the Corporation Tramways Committee and Electricity Committee was held on the 9th inst., to consider the dispute between the committees as to the charges for energy for traction purposes. It was stated that the Electricity Committee had rendered an account to the Tramways Department for energy for traction amounting to £8,446 for the 11 months up to the end of February, and an account for £510 for March, a total of £8,956 for the financial year. In the opinion of the tramways manager, Mr. L. E. Harvey, the consumption of energy represented by this account was excessive, and representations were made by him, with the result that the meters were tested and found to be defective. The meters having been recalibrated, the consumption from April 1st was found to be at the rate of 1·37 units per car-mile, and Mr. Harvey suggested, as a compromise, that the Tramways Committee should pay for the 12 months at the rate of 1·45 units per car-mile, which would make the account £6,795, and that the electricity department should grant a rebate of £501 on the previous year's account, bringing the total down to £6,294. The Electricity Committee offered to make an allowance of £1,057, reducing the bill to £7,930, and the sub-committee now endeavoured to adjust the difference. Mr. Wylie, chairman of the Tramways Committee, undertook to recommend his committee to forego the claim for a rebate of £500 for 1907, and settle the 19·8 account on the basis of 1·37 units per car-mile. The representatives of the Electricity Committee declined to agree to this proposal, and Alderman Rennoldson, the chairman of that committee, offered to recommend his committee to grant an abatement of £1,850, the claim of the Tramways Committee with respect to 1908 to be waived. This proposal would reduce the account to £7,107, and it was unanimously adopted. It represents a consumption of 1·52 units per car-mile. If this settlement is ratified, it will mean that the tramways balance-sheet for the past year will show a credit balance, instead of a loss; but probably the electricity department will then be unable to show a profit for 1908.

Taunton.—The tramways extension to Rowbarton has been practically completed, and the company is now carrying out repairs to the old track, as required by the borough surveyor.

Walsall.—In a report to the T.C., the Corporation Tramways Committee states that it has had before it a suggestion that the tramways should be extended from Walsall Wood through Brownhills, Chasetown, Chase Terrace and Heath Hayes to Cannock, and from there back to Bloxwich, and that it has appointed a sub-committee to report on the subject. The extension, if carried out, would open up the most populous portion of Cannock Chase.

Whitworth.—The Lancashire and Yorkshire Railway Co. has intimated to the Town Clerk of Bacup that it intends to oppose any application for a light railways order to extend the Whitworth trams to the centre of Bacup. The company had presented a petition to Parliament opposing the Bill confirming the Whitworth Tramways Order.

Wolverhampton.—The Corporation Tramways Committee, in its annual report on the working of the Lorain system, states that the gross profit for the year has been £17,048, and after meeting financial charges, the balance of profit was appropriated thus:—For loss on omnibus account, £82; reserve or renewals account, £4,505; extraordinary items of expenditure, £573; leaving a balance unappropriated of £746 13s. 9d. The sum of £26,590 now stands to the credit of the renewals fund.

The Committee expresses regret that the traffic receipts on the electric cars, in common with most other tramway undertakings, show a considerable decrease for the year as compared with the previous 12 months. The Committee considers it very gratifying to record a substantial decrease in the working costs per mile of the Lorain surface contact system as compared with last year, these being 6·374d. against 6·509d., or a reduction of ·135d. per car-mile.

The motor-omnibus account shows total receipts of £2,658.

TELEGRAPH and TELEPHONE NOTES.

Argentina.—The proposed agreement between the Argentine Government and the Western Telegraph Co., to which reference was made a few weeks ago, relates to the laying of a cable between Argentina and Europe. It is in reality directed, a Frankfort paper declares, against the efforts of Germany to establish a cable to South America. Nevertheless, the newspaper states that public opinion in Argentina is by no means agreed with the arrangement, by means of which the Argentine Government grants a monopoly to the company in question, and thereby binds its hands for the future. Thus the *Prensa* of July 1st remarks that "the monopoly clause in the contract proposed by the Western Telegraph Co. must be excluded. The same is unnecessary, as the times are past when the Argentine Republic must be induced to draw upon foreign capital by the granting of monopolies." According to an announcement made by another Argentine newspaper, the German South American Telegraph Co., with the support of the German Government, has lodged a protest against the proposal.

Telegraphic Interruptions and Repairs:—

	Interrupted.	Repaired.
Dakar-Conakry	May 18, 1909	
Tangier-Cadiz	May 19, 1909	
Cayenne-Salinas	June 7, 1909	
Trinidad-Demerara	June 19, 1909	July 10, 1909
Assab-Perim	July 8, 1909	

Telegraph Arbitration Bill.—On Tuesday this Bill, which is intended to facilitate the purchase of the National Telephone Co.'s system by the Post Office, came before a committee of the House of Commons. On Clause 1, which provides for the reference, by agreement, of any matter in dispute between the parties to the Railway and Canal Commission as arbitrators, Mr. McArthur proposed that the Commissioners should be given power to allow costs. Mr. Buxton opposed the amendment, on the ground that when the agreement was signed the parties knew that the Commissioners were not entitled to give costs, and that the grant of such power would not expedite matters. The amendment was defeated, and the committee ordered the Bill to be reported to the House.

CONTRACTS OPEN and CLOSED.

OPEN.

Acton.—Tenders are about to be called for lamps, &c., for the new public offices.

Altrincham.—July 30th. Electrical installation at the new Higher Elementary Schools, Hale (deposit, £1 1s.). J. Howarth, Clerk, Education Department, Altrincham, Cheshire.

Australia.—MELBOURNE.—August 4th. Overhead travelling crane for the Council. See "Official Notices" June 11th.

Ten 100-number switchboards for the Postmaster-General's department in New South Wales. See "Official Notices" to-day.

Belgium.—August 4th. La Direction Generale des Ponts et Chaussees (38, Rue de Louvain, Brussels) is inviting tenders for the equipment of a transformer sub-station at the harbour at Ostend.

Bradford.—July 30th. Eight automatic point controllers for the Tramways Department. See "Official Notices" July 9th.

Brussels.—July 28th. A number of the contracts for the electric lighting material for Tournai are open again, as the last tenders were not satisfactory. They include (*a*) insulators, (*b*) phosphor-bronze wire, (*c*) small metallic material for incandescent lamps, &c., (*f*) lamps and lighting and wiring fittings.

Canada.—WINNIPEG.—August 2nd and 16th. The city of Winnipeg is advertising for tenders for the hydraulic and electric equipment of the generating station now under construction on the Winnipeg River, at Thirty-foot Falls. Some particulars were given in this column on July 2nd.

Dublin.—July 26th. Machinery oils for the Corporation electricity works. See "Official Notices" to-day.

Eccles.—July 19th. Electric wiring and fittings for 12 houses for the T.C. (deposit, 10s. 6d.). E. Parkes, Town Clerk.

Edmonton.—July 28th. Private telephone equipment at the infirmary. See "Official Notices" to-day.

France.—July 21st. The Paris municipal authorities are inviting tenders for a 60-H.P. steam engine and a 40-KW. continuous-current dynamo at the Paris Municipal School of Physics and Industrial Chemistry.

PARIS.—August 18th. The Under-Secretary for Posts and Telegraphs, 103, Rue de Grenelle, Paris, requires tenders for 75 stamping machines worked by electric motors.

July 22nd.—The French Post and Telegraph authorities in Paris (103, Rue de Grenelle) are inviting tenders for the supply of 10 tons of galvanised iron wire 1 mm. dia., 200 tons ditto 3 mm. dia., and 400 tons ditto 4 mm. dia.

August 11th. The Direction de la Manufacture d'Armes at Châtellerault (Vienne) require tenders for cables, copper wire, and dynamo construction material (11 lots).

PARIS.—July 26th. The Under-Secretary for Posts and Telegraphs, 103, Rue de Grenelle, Paris, requires tenders for 10 lots of telegraph and telephone (subscribers) material.

Germany.—CHARLOTTENBURG.—August 6th. A 6-ton travelling crane of 19 m. span is required for the new waterworks by the Charlottenburg Wasserwerke Co., and specifications may be obtained at their office, Escheraller 1.

Hellingly (Sussex).—July 20th. Storage battery for the County Asylum. See "Official Notices" July 9th.

Hull.—July 28th. Electric and gas light fittings for the new Public Hall of the Corporation. See "Official Notices" to-day.

Hull.—July 29th. Electric lighting mains extensions for the year for the E.L. Committee. See "Official Notices" July 9th.

Italy.—August 10th. The Italian State Railway authorities in Rome are inviting tenders from foreign as well as from home makers for the supply of 100,000 metres of telegraph cable.

Keighley.—August 7th. Two 1,000-KW. turbo-alternators with condensers, and two water-tube boilers for the electricity department. See "Official Notices" to-day.

Leyton.—July 27th. Electric light installation for Sybourn Street School for the U.D.C. Education Committee. Architect, Mr. W. Jacques, 2, Fen Court, Fenchurch Street, E.C. (deposit, £1).

London.—L.C.C.—July 21st. Electric lighting and fan installation at the extension of the Paddington Technical Institute. See "Official Notices" July 9th.

G.P.O.—August 9th. Creosoting telegraph poles for the P.M.G. Mr. G. Morgan, Controller of Stores, 17-19, Bedford Street, W.C.

Luton.—July 19th. 500-KW. steam-driven generator and condensing plant for the Electricity Department. See "Official Notices" July 2nd.

Pontypridd.—July 27th. One 500-KW. steam dynamo for the U.D.C. See "Official Notices" to-day.

Russia.—September. The Governor of Jekaterinoslaw requires tenders for the lighting of the streets of Bachmut by electricity, either arc or incandescent lamps.

Spain.—August 26th. Sixty years' electric tramway concession (between Monachil and the suburbs of Gabia Grande, Granada province). Tenders, with £130 deposit, to Direccion General de Obras Publicas, Madrid.

Sunderland.—The Tramways Committee is to advertise for tenders for the doubling of half-a-mile of the track upon the Grangetown section of the Corporation electric system.

Whitehaven.—July 20th. Lighting the Harbour Quays for five years, by electricity, gas, or other means, for the Harbour Commissioners. See "Official Notices" June 11th

CLOSED.

Australia.—ADELAIDE.—News was received by this week's Australian mail of the acceptance of the tender, at £36,673, for 50 cars from the J. G. Brill Co., Philadelphia, U.S.A., for the Adelaide tramway system. The highest tender was submitted by an Adelaide firm, who offered to build the cars locally for £45,361.

Bournemouth.—At a recent meeting the Council decided to place eight international time recorders at various points on its tramway routes, to record the times the cars pass on both the up and down lines, and the order was given to the International Time Recording Co., of City Road, E.C., whose tramway recorders are already in use by numerous corporations and private companies in Great Britain.

Bradford.—The T.C. has accepted the tender of Messrs. Manlove, Alliott & Co., Ltd., for the reconstruction of the destructor cells at the Cliffe Road works, at £2,472. The tender of Messrs. Gent & Co. for an extension of about 100 electric impulse clocks, with master clock and wiring, for the Town Hall, has been accepted, at £194.

London.—L.C.C.—The following tenders were received for wooden fittings for 130 electric cars:—

James Challis, Ltd. .. .. (less 2½%)	£772
B. E. Nightingale	987
Hurst, Nelson & Co., Ltd.	1,050
United Electric Car Co., Ltd.	1,418

It was subsequently discovered that the fittings could be supplied from the Council's own car works at Leytonstone for £558, as there is a good deal of timber there that was taken over at a low price from the tramway companies.

HAMMERSMITH.—The following tenders were received by the Electricity Committee for the supply of cable and the purchase of old cable to be replaced, viz.:—

	Quotation for cable. 215 yards 1·25 E.H.T.	Offer for old cable. 163 yards 8 E.H.T.
Standard Cable Co.	£161	Scrap price, no amount mentioned.
Western Electric Co. (recommended)	190	£85
Henley's Telegraph Works Co. ..	185	80
Siemens Bros. Dynamo Works ..	188	82
Callender's Cable, &c., Co.	190	80
Lahmeyer Electrical Co.	192	80

As a quotation for the old cable was made a condition of tendering for the supply of the new cable, the tender of the Standard Cable Co. was out of order, as they did not name a price for the old cable.

STEPNEY.—The Electricity Committee recommends the acceptance of the tender of the Sloan Electrical Co., Ltd., for carbons, at £1,092. The tenders were as follows:—

Sloan Electrical Co.	(recommended)	£1,092
Union Electric Co., Ltd.		1,123
Crompton & Co., Ltd.		1,144
General Electric Co., Ltd.		1,184
Braulik, G.		1,190
Siemens Bros. Dynamo Works, Ltd.		1,434

The tenders for meters, for two years' supply, were as follows:—

Bastian Meter Co., Ltd. ..	(incomplete, does not comply)	£281
Electrical Apparatus Co., Ltd. ..	„ „	402
Gillespie & Beales	(incomplete, no samples)	422
British Westinghouse Electric Co., Ltd.	(incomplete, does not comply)	522
Braulik, G.	.. (does not comply)	545
Electrical Co., Ltd. (*a*)	„	577
Simplex Conduits, Ltd.	„	591
International Electric Co.	(no samples)	604
Electrical Co., Ltd. (*b*)	.. (does not comply)	650
Reason Manufacturing Co., Ltd.	.. (recommended)	671
Siemens Bros. Dynamo Works, Ltd.		713
British Thomson-Houston Co., Ltd.		761
Bat Meter Co.		765
Chamberlain & Hookham, Ltd.		878
Ferranti, Ltd.		878
General Electric Co., Ltd.		939

The Reason Manufacturing Co., Ltd., submitted the lowest tender which complies with the specification. The meters tendered for are of a capacity of from 2·5 amperes to 300 amperes, and in this connection the borough electrical engineer and manager has pointed out that for the meters of a lower capacity, that is, meters of a capacity of 2·5 amperes and 5 amperes, the "Midget" type of meter manufactured by the Reason Co., could be used. This would reduce the tender of the Reason Manufacturing Co., Ltd., by £94, making it £578. The borough electrical engineer and manager is satisfied with the "Midget" type of meter, and having regard thereto, and to the saving which would be effected by using the same, the committee recommend the acceptance of the tender of £671, less £94.

Plymouth.—The T.C. has accepted the tender of Cory Bros. & Co., Ltd., for 7,500 tons of Russell's new black vein washed beans coal at 13s. 4½d. per ton by sea, and 17s. 1d. per ton by rail, for the electricity undertaking. This price is 3d. per ton in excess of last year's contract.

Rotherham.—The T.C. has accepted the tender of Felgate & Storey, Reading, for the electrical installation at the High School, for £225.

Stockport.—The T.C. has accepted the tender of Messrs. John Longson, Ltd., for electricity requirements; and that of Messrs. Wilson, Twyford & Roscoe for tramway requirements.

Swansea.—The following tenders for plant for lighting and power purposes at the new King's Dock were unanimously accepted at a meeting of the Harbour Trust on Monday:—

Turbo-generators, alternators and condensers.—Willans & Robinson, Ltd.
Switchboards and sub-station equipment.—Crompton & Co., Ltd.
Boilers.—H. & T. Danks (Netherton), Ltd.

Some extraordinary tendering was reported at the Swansea Education Committee on Monday for electric light wiring and

fittings for the new Swansea Technical College. Eight tenders had been received; the highest was from T. Arthur Evans and Co., Swansea, amount £817, and the lowest from A. G. Arnold and Son, Newport, amount £289 12s. 8d. The latter was recommended for acceptance, but the firm wrote stating that they had made mistakes in two items, and desired to increase their tender to £366. The next lowest on the list was from Mr. E. Perman, also of Newport, amount £337 11s. 4d., but the Committee was disposed to give the contract to a Swansea firm, and the matter was deferred, the whole of the firms to be asked to re-tender. Resolutions for the equipment of the new electrical engineering laboratory, at a cost of £250, were approved.

Walsall.—The T.C. has accepted the tender of the Wood Farm Colliery Co., Ltd., to supply 1,000 tons of steam coal for the electricity works.

Warrington.—The T.C. has accepted the following tenders for annual supplies:—

British Electrical Engineering Co.—Transformers.
Mawdsleys, Ltd.—D.C. motors, ½-H.P. to 5-H.P.
British Westinghouse Co.—D.C. motors from 7½-H.P. to 20-H.P.
British Thomson-Houston Co.—A.C. motors.

Wolverhampton.—The T.C. has accepted the tender of James Hodgkinson (Salford), Ltd., at £750, for a coal-conveying plant and coking stokers for the generating station.

The Tramways Committee of the T C. has accepted the tender of the Wolverhampton and District Electric Tramways, Ltd., for 11 magnet equipments, at £500.

Worcester.—The T.C. has accepted the tender of Messrs. Heenan & Froude, Ltd., for a steel storage bunker and elevator and conveyor at the Hylton Road station, at £656.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Saturday, July 17th. At 10 a.m. Visit to the ordnance engineering works of Messrs. Vickers, Sons & Maxim, Erith.

PARLIAMENTARY.

Electric Lighting Acts (Amendment) Bill.

THE above Bill, which the Government have introduced for the purpose either of generalising provisions usually inserted in local Acts dealing with electric supply, or of removing certain further difficulties which have been experienced in the working of the Electric Lighting Acts, has been remitted to Standing Committee C, and already a large number of amendments have been scheduled.

At the end of Clause 2, which deals with the construction of generating stations on land acquired by agreement, Mr. A. H. Scott will move to add, "This section shall not apply to any station or works for transforming, connecting or distributing electrical energy, or the machinery or appliances used in connection therewith."

On Clause 4, dealing with supply in bulk, Mr. Scott will move to add the words, "Provided that a provisional order authorising the breaking-up of roads outside the area of supply of the local authority or company by whom the supply is to be given shall not be granted by the Board of Trade except with the consent of the local authority in whose district the road is situate, unless the Board of Trade in any case in which the consent of any such local authority is refused are of opinion that, having regard to all the circumstances of the case, such consent ought to be dispensed with, and in that case they shall make a special report to Parliament stating the ground on which they have dispensed with the consent."

Mr. Leverton Harris has given notice to move the following new section to Clause 4: "(4) The powers contained in this section shall not apply to the County of London or to any area contiguous to that county wherein a supply of electricity is afforded by a local authority or company authorised to distribute electricity within that county.

On Clause 5, dealing with the supply of electricity to railways, tramways and canals partly outside the area of supply, Mr. Harmood Banner will move the omission of Sub-sec. II, which states that the Board of Trade may, by provisional order, authorise any such local authority, company or person so to supply electricity to be used for purposes incidental to the working or lighting of the railway, tramway or canal other than the purposes aforesaid.

Mr. Holt proposes to add "dock estate" to railway, tramway or canal.

On Clause 6, which deals with supply to premises outside the area of supply in certain cases, Mr. Tennant will move to add: "Provided that the Board of Trade shall not make any such order except with the consent of the local authority within whose district the premises are situate, unless the Board of Trade in any case in which the consent of such local authority is refused are of opinion that, having regard to all the circumstances of the case, such consent ought to be dispensed with, and in such case the Board shall make a special report stating the grounds upon which they have dispensed with such consent."

On Clause 7, containing provisions as to the right of the local authorities to purchase generating stations, &c., situated outside their districts, Mr. A. H Scott will move to add: "(3) Without prejudice to the foregoing provisions of this section, where the undertaking of a company is situate within the districts of two or more local authorities the Board of Trade may by provisional order transfer any rights of purchase vested in the local authority of any district in which part of the undertaking is situate to the local authority of any other district in which part of such undertaking is situate, but such provisional order shall not be made except with the consent of both such local authorities."

A large number of amendments will be moved on Clause 16, which provides for the local authorities "through a contractor but not otherwise" to let for hire electrical fittings. Mr. Cleland proposes to strike out the words "through a contractor but not otherwise," and there are several amendments for the deletion of Sub-sec. D, which gives the undertakers the power of exercising the powers of the Clause without the employment of a contractor if there is no firm carrying on the business of electrical contractor within the area of supply.

Notice of intention to move the following new Clauses has also been given:—

By Mr. Tennant: "Money borrowed under the Electric Lighting Acts shall not be reckoned as part of the total debt of a local authority for the purpose of any limitation on borrowing under the enactments relating to borrowing by the local authority."

By Mr. Cleland: "Where in any area a local authority, company, or person is authorised to supply electricity under Act of Parliament, or under licence or provisional order granted under the Electric Lighting Acts, it shall not, after the passing of this Act, be lawful, without the consent of such local authority, company, or person, for any other local authority, company, or person to supply, distribute, or transmit electricity within the same area unless such supply, distribution, or transmission is authorised by Act of Parliament, or by licence or provisional order granted in terms of the Electric Lighting Acts."

"Nothing in this Act contained shall supersede, prejudice, or affect the provisions of any local Act or any order confirmed by Act of Parliament applicable to the Corporation of the city of Glasgow."

"Nothing in this Act contained shall supersede, prejudice, or affect the provisions of any local Act or any order confirmed by Act of Parliament applicable to any undertakers."

"Where in any area a local authority, company, or person is authorised to supply electricity under Act of Parliament or under licence or provisional order granted under the Electric Lighting Acts, it shall not, after the passing of this Act, be lawful without the consent of such local authority, company, or person for any other local authority, company, or person to supply, distribute, or transmit electricity within the same area unless such supply, distribution, or transmission is authorised by Act of Parliament or by licence or provisional order granted in terms of the Electric Lighting Acts."

By Mr. A. H. Scott: "Sub-sec. 2 of Sec. 234 of the Public Health Act, 1875 (which places a restriction upon the amount which a local authority may borrow under that Act) shall not apply to sums borrowed by any undertakers (being a local authority) for the purposes of the Electric Lighting Acts, or of any provisional order under the Electric Lighting Acts, and in calculating the amount which any local authority may borrow under the Public Health Act, 1875, the sums borrowed by them for those purposes shall not be reckoned."

"Where in any area a local authority, company, or person is authorised to supply electricity under Act of Parliament or under licence or provisional order granted under the Electric Lighting Acts it shall not, after the passing of this Act, be lawful, without the consent of such local authority, company, or person, for any other local authority, company, or person to supply, distribute, or transmit electricity within the same area unless such supply, distribution, or transmission is authorised by Act of Parliament or by licence or provisional order granted in terms of the Electric Lighting Acts."

"Except by this Act expressly provided, nothing contained in this Act shall prejudice or affect any powers or rights conferred upon any undertakers by Act of Parliament or provisional order passed or confirmed before the passing of this Act."

The Bill was to be considered by Committee C yesterday.

Third Reading.—In the House of Commons, on July 12th, the West Kent Electric Power Bill was read a third time.

Folkestone, Sandgate and Hythe Tramways Bill.—This Bill, as amended by the House of Commons, was on Tuesday before the House of Lords Committee as an unopposed Bill, and was ordered to be reported for third reading. It will be remembered that the House of Commons Committee struck out the important clauses allowing the substitution of some other system for the conduit system.

Oxford and District Tramways.—This Bill, which provides for the substitution of the conduit and overhead system in place of the Dolter surface-contact system, was on Tuesday before Lord Onslow's Committee of the House of Lords. There was no opposition, and the Bill was reported for third reading.

Torquay and Paignton Tramways.—The Torquay and Paignton Tramways Bill came on Tuesday before the House of Lords Committee on Unopposed Bills, and was ordered to proceed.

Fire Tests.—On July 7th the British Fire Prevention Committee continued their series of fire tests with doors by testing a large roller shutter to a 7-ft. opening, the temperatures ranging up to 1,800° F, followed by the application of water from a steam fire-engine, the test lasting 2½ hours.

NOTES.

Navigation Improvements and Hydro-Electric Works.—The question of improving the means of transport between Marseilles and Geneva, so as to allow vessels having a cargo of 500 tons to journey between the Rhone and the Rhine, has incidentally brought into prominence a comprehensive scheme of electricity supply. Already ships of this capacity are able to travel, with the exception of a few days, all the year round between Lyons and Arles, and the canal now being constructed between Arles and Marseilles will complete the southern connection. As to the northern section between Lyons and Geneva, the deep slopes of the land render the Rhone completely impracticable to navigation. Between Lyons and Jonage, which is about 9½ miles below Lyons, the vessels are able to use the derivation canal of the well-known Jonage electricity works, but this distance only represents a few miles, whereas the section from Lyons to Geneva is 112 miles long. It is considered that the navigability of the river between Bellegarde, which is 18·6 miles below Lyons, and Geneva can only be effected by carrying out the project suggested by MM. Blondel, Harlé and Mähl. These engineers have asked the French Government to authorise them to proceed, at their own expense, with the establishment of electricity works at Genissiat (near Bellegarde), which, by means of damming the Rhone, would permit of the creation of one of the largest works in Europe, and the electricity generated for the most part would be transmitted to Paris. The dam would be 230 ft. high, and in this way a canal of a length of 14·8 miles would be formed, whilst the construction of electricity works at Chancy, in the Canton of Geneva, near the French frontier, would largely facilitate the navigability of the last part of the Rhone to Geneva. It is stated that the French Minister of Public Works has no objection to the proposed works at Chancy, for which MM. Terrisse and De Loriol have sought a concession for several years past, but a decision on either of the schemes is still awaited.

Late Legal.—SEEBOLD *v.* PAGE & MILES.—Mr. Justice Bucknill on Wednesday delivered a considered judgment in this action, which was brought by the plaintiff for damages for alleged breach of contract. Defendants denied the breach and counter-claimed for £25 6s. 8d. for work done and materials supplied. The case was reported in our issues of April 30th, *et sqq.* His Lordship, in giving judgment, after stating the facts and the terms of the contract, said that the question was whether the contract had been performed by the defendants. It was not suggested that there was anything the matter with the engine or gas producer, or with the generator or scrubber, but the plaintiff's case was that these things were not carefully fixed up, and that from their being improperly and negligently fixed, the plaintiff was injured, in that the work had to be stopped, and he could not make sufficient electric light for the theatre, and had to go to the Corporation of Worthing and take the light at a greater expense. Plaintiff claimed, in addition, the expenses to which he had been put in making the plant do its work properly. To make the plant work properly, it was requisite that it should be kept clean and treated with care. It was alleged that defendants had been guilty of negligence in not providing iron silencers instead of the brick chambers or pits. The defendants, however, were not bound to put before the plaintiff the alternative whether the brick chambers or the iron box should be used for silencing. He found, as a fact, that, but for accident, the silencers put in were efficient. Turning to the question of the explosions, his Lordship referred to the fact that the man put in charge of the engines could neither read nor write; he appeared to be a man of limited intelligence, who was now employed on a horse 'bus. Before he took charge of the engines, there had been no explosion, and they had been running for six months under the supervision of the defendants' foreman. The young man took charge in January, and the explosion took place in the following month, as the defendants alleged, from the negligence of the driver. He did not propose to say how the explosions did occur, but he found, as a fact, that they did not occur in consequence of any of the things alleged against the defendants. He found that the installation was properly put together; the objectionable smell complained of had not been caused by any defect in the defendants' work; and, on the whole, he found that the work had been properly carried out. The plaintiff's case, therefore, failed on every point, and an agreement having been arrived at on the counterclaim, there must be judgment for the defendants on the claim and on the counterclaim of £25, with costs on both. Judgment accordingly.

The High Price of Rubber.—The *India Rubber World* of New York publishes the following interesting remarks regarding the rubber outlook:—"The topic of chief interest and importance to the rubber trade to-day is the high cost of rubber, and this involves the consideration of whether lower prices are a near possibility. It may be that the rates just now prevailing will not be long maintained, but no present indication points to really cheap rubber. A salient fact is that the recent record high prices accompanied probably the largest production of the raw material in any year, from a constantly increasing number of sources, under conditions which preclude any idea that supplies have been under manipulative control, and in spite of the fact that the market is soon to receive larger quantities of rubber from plantations. Clearly the explanation is in a growing demand for rubber in the industries—a larger production of goods either actual or in prospect. It is of interest, therefore, to consider the probable output of rubber in the early future. The growing production on plantations has been mentioned; there is reason to believe that the Amazon region will continue slowly to increase its yield, year by year, as has been the case for a half century, as the available working force can be augmented. The net total supply from other forest sources does not promise any increase. Meanwhile the world's needs for rubber grow incessantly. Can the plantations keep pace with the growing demand? From time to time *The India-Rubber World* has reported on the progress of typical plantations of Hevea, as it does in this issue, the point of each report being a rapid increase of annual yield and a lower cost of production. But still the total plantation yield is too small to be of great present importance to the industry; it is of interest more from the promise which it gives for the future. While all the plantations that have been formed may not prove so successful as 'Lanadron' or 'Vallambrosa,' for example, undoubtedly many millions of trees already planted will in time become prolific yielders of rubber. But, as we have said, the demand for rubber grows. Our friends in the East continue to discuss the cost of their rubber as compared with Brazilian, evidently with the idea that they possess a marked advantage. But so long as present conditions of supply and demand obtain, the world will need all the rubber that can be produced in the Amazon region as matters exist there. And considering that real 'Pará' rubber has not been produced elsewhere, it is not unlikely that this grade will yet outrank the best plantation rubber in the matter of prices. Malaysian planters may produce rubber at a low cost, but they cannot meet the world's demand for quantity, nor supply everything that is needed in the way of quality. All of which being true, the world must pay enough for Brazilian rubber to make its production interesting to the *seringueiros*."

Salaries and Prospects for Engineers in India.—A correspondent ("Entropy") writes in the *Engineer* giving advice regarding the salaries that should be asked by men contemplating going out to India from home. He says:—

"A salary of Rs. 300 (£20) per month is for juniors, who do not go out to accept extensive responsibility, and every farthing of that amount is required for living expenses in any city in India, and it would be preferable to work at home on £2 per week than be reduced to the necessity of living in a mixed community in Calcutta in order to save a few rupees off 300 per month.

"The above is the lowest possible figure that any young fellow who has served an apprenticeship can go out upon, and the yearly increase of salary should not be less than Rs. 50 per month throughout the term of service. A man of over 24 years of age should not go out on less than Rs. 400, and if to take charge in any department, on not less than Rs. 600 per month.

"It would be well for any applicant before signing an agreement for service in India to apply to, say, the Institution of Civil Engineers, the secretary of which would no doubt be pleased to recommend a solicitor to inspect, and, if need be, to modify the terms of agreement.

"An outsider stands no greater chance of promotion in any firm in Calcutta than in London; the changes on the staff are quicker, but unlike the conditions at home it is seldom beneficial, or even creditable, to change your firm. Prospects advertised by those whose interests it may be to get capable men on prospects are often found to be those of being ousted by nepotism, and of having most of the hard work and few of the loaves and fishes.

"The possibility of a bonus may be discovered to you, but it generally belongs to a nebular series; in fact, the only prospect that is not written in the agreement is that of being punted home as an invalid after a few years' service, or of finding an opening in the vicinity of Lower Circular Road, without a concrete slab to keep you down.

"I may remark that in the department in which I was engaged in Calcutta for three years, in that time out of a European staff of seven men, three had been invalided home and other two had died; of the remaining two, one was born in India. This may be a somewhat exceptional record of European mortality, but such can be the rate amongst assistants whose salaries afford but a bare living and whose prospects are nil.

"It is a mistake to accept an agreement specifying second-class travel; everybody in India travels first-class, and likewise to and from India, except with the P. and O. mail-boats, when second-class is good enough for most people. In the early days men worked out there in their shirt-sleeves, and lived pretty much anyhow, but the advent of the memsahib has changed all that, and nowadays top hats are not stoned, and people dine at eight."

Electrolytic Disinfectant at Poplar.—Dr. F. W. Alexander, the Medical Officer of Health for Poplar Borough, refers in the course of his annual report just issued, to the working of the electrolytic disinfectant department during 1908. The plant has been installed three years, and is still in good working order, producing 185 gallons of fluid in eight hours, at an average strength of 4·5 to 5·0 grammes of chlorine per litre. Repairs, renewals and improvements during the year cost £45. 28,280 gallons of the electrolytic fluid have been manufactured and distributed, the total cost of materials used being £56 2s. 5d., including £28 7s. 10d. for 4,548 units of electricity at 1½d. Dr. Klein, bacteriologist to the L.G.B., in a recent report arrives at the conclusion that 1 oz. of the fluid to 150 oz. of water (or 1 oz. in nearly 1 gallon of water) will kill the cholera germ in 2½ minutes, and the electrolytic fluid in the same proportion will kill the germ of typhoid fever. The germ of plague would be killed by a more largely diluted solution, as its vitality is much less than that of cholera and typhoid fever. Dr. Alexander says that during 1908 there must have been a saving to the borough of £700. The plant has paid for itself and the depôt, while there has also been a saving of considerably over £1,200 to the borough, and the health of the inhabitants is good.

Educational Notes.—University College Awards.—The following awards have been made at University College (London University):—Archibald P. Head Memorial Medal, 1908-9, R. A. Pfeiderer. Engineering Diplomas—H. F. Anns (Civil), E. E. Baily (Civil and Municipal), S. M. Hitchcock (Electrical), J. W. Mason (Civil), S. G. Nottage (Electrical, with distinction), B. J. Pfeiderer (Mechanical), R. A. Pfeiderer (Mechanical, with distinction), A. C. Russell (Mechanical, with distinction), A. M. Sims (Civil and Municipal), A. T. C. Sutton (Civil and Municipal), F. L. Thompson (Civil and Municipal).

Imperial College of Science and Technology.—On Thursday last week the King laid the foundation stone of the new College at South Kensington, which will consist of mining, metallurgical, geological and engineering departments; the last-named adjoins the Central Technical College of the City and Guilds Institute, which will form an integral part of the scheme.

Electric Shock Fatalities.—According to the *Daily Telegraph*, an inquiry into the death of Samuel Higgs, 36, and Daniel Eyre, 27, miners, who were killed whilst engaged with an electric coal-cutting machine at the Clifton pit, was concluded on Tuesday at Nottingham. The jury returned a verdict that the men accidentally met their deaths through an oversight in the inspection of the working of the machine, "the 'pommel' of which was not in order to carry away the escaping current."

Mine Accident Inquiry.—An inquiry has just been completed by agents of the Lanarkshire Miners' Union into the cause of the recent explosion in the No. 1 pit, Fernicgair Colliery, Hamilton. Three men were working an electrically driven coal-cutting machine on one of the seams when the explosion took place. The agents' report is of such a nature that the Union executive has decided to lay the whole circumstances before the Home Office, with a request that a Government inquiry be made into the cause of the accident.

City of London Lighting.—The deputation appointed by the Corporation to visit Continental cities *re* public lighting has reported as follows:—"We are of opinion that the public lighting in the City of London can be materially improved, and we have come to the following conclusions:—(1) That, wherever possible, streets should be lighted by means of centrally hung lamps with lowering gear. This we think particularly important in the City of London, where the number of obstructions upon the footways in the form of lamp-posts, bins, letter-boxes, &c., is so large. (2) That open spaces should be lighted by means of lamps upon standards, fitted with lowering gear. (3) That high-pressure incandescent gas lamps with inverted burners should be adopted as the illuminant, but where gas is impracticable, electricity with open arc and flame arc lamps should be installed. We think, however, before suggesting any drastic alterations in the general lighting of the City, that the Streets Committee should be authorised to arrange for some further experimental lighting of the City thoroughfares." We refer to this matter in our leading columns.

Mediterranean Push.—Messrs. Gent & Co. send us the following amusing example of the business methods pursued by two of our Maltese fellow-subjects:—

"Reg. A, Letter No. 1.

"Malta, *July 2nd*, 1909.

"Mr. Gent & Co., London.

"As we are on the point to leave our station as electrical apprentices in the Government department, we have decided to introduce your well-known firm in our country, and so will start business with you under the above condition.

"That you will supply us with electrical materials to our account, with a percentage discount, paying you six months after the expedition.

"That in the meantime we will represent you as your sole agents with a favourable percentage discount, and that the materials will be forwarded to us, shipment paid.

"We hope that as no one yet represents you here, our demand will be taken into a favourable consideration, and that in a very short time we will have your esteemed answer.

"With many thanks, we remain ——."

Gas Poisoning.—In the report of the Medical Inspector to the Home Office for 1908, he states that there were 55 cases (five fatal) of carbonic oxide poisoning, as compared with 81 cases (10 fatal) in 1907. Twenty-six were in connection with blast furnaces; 19 (two fatal) were due to "power gas, producer or suction gas"; some of these occurred whilst starting up the engine, others were caused by escape from exhaust pipes (in one case leaking into a cotton mill and rendering four operatives unconscious), feeding the hopper, and a leak in the generator. Seven were due to escape of coal gas—in one case overcoming four weavers—and two followed on the inhalation of fumes from a coke fire.

Duncan Watson v. Jackson.—On Friday last, before His Honour Judge Bacon, at the Bloomsbury County Court, Mr. H. Jackson, late manager to Roger Dawson, Ltd., was sued by Mr. Duncan Watson, who recently purchased the goodwill of the late firm, for the value of goods sent by the firm to defendant's private house. Defendant said that some of the goods were booked out to him in error, instead of to clients, and other goods returned were not booked in. Plaintiff claimed that the fact of these goods being booked out to defendant made him responsible for them, and he brought this action to recover the price (50s.) of same. Defendant counterclaimed for some fittings belonging to him, which he said plaintiff had undertaken to return, but which had not been returned. Judgment was given for defendant both on the claim and counterclaim.

E.C.C. Rolling Mill Installation.—It having been reported that Sir Alfred Hickman had said that he would have been better served if he had entrusted the installation of the electrically-driven rolling mills at his works to German contractors, the Electric Construction Co., Ltd., who carried out the work, quite naturally opened their eyes very widely with surprise, then frowned, and next wrote a letter to the *Iron and Steel Times*, in which the statement appeared, asking for an apology and withdrawal. Sir Alfred Hickman writes to the same journal emphatically contradicting the statement. He adds:—"It is true that some difficulties not unusual in a new departure have been experienced, but, if I am correctly informed, they are far less than have attended a somewhat similar installation by a German firm at works in the north, the engineering staff of which have honoured me by repeated visits in order to obtain information and assistance. The arrangements here are not yet perfected; but there has been no shirking of responsibility on the part of the contractors, and I have every confidence that in the end the work will be fully equal, if not superior, to anything the Germans have done, and the cost will certainly not be greater than they would have charged."

Institution and Lecture Notes.—Institution of Mining Electrical Engineers.—At a meeting held on the 7th inst., at Ilfracombe, under the chairmanship of Mr. H. F. J. Stewart, A.M.I.E.E., it was unanimously resolved to form a branch of the above Institution, there being many prospective members present, including several mining engineers and managers from the Gloucester and Somerset coal fields and the Cornish tin mines. The chairman said that there were already 12 centres; the Southern Section would cover a very large district, but its mineral area was almost entirely confined to the Western Counties. This part of Devon was about midway between the Gloucester mines and the wheals of the Duchy, and seeing the unique nature of its mining operations in these islands, he hoped that the Stannaries would send strong support to the Institution. The number of applications already received was entirely satisfactory, the members and associates showing a total to date of 230. It was agreed that the hon. secretary should be asked to approach Mr. R. Hood Haggie, with a view to his election as president of the Section, and a small provisional committee was formed, with Mr. H. J. F. Stewart as chairman.

At a meeting of the Royal Cornwall Polytechnic Society on the 7th inst., Mr. N. Trestrail read a paper on the Cornish Pumping Engine, which he said was the most durable and economical plant yet installed for the work. Fast running engines or electric motors attached to a pump might, if not economical, appear highly satisfactory whilst running for a short time; but when the weak points began to fail, endless trouble was caused by frequent stoppages. Mr. H. Davey said he did not think that electricity could compete with the Cornish engine in economy of fuel, but he protested against a too hasty generalisation. Mr. L. Hards, of Camborne Urban Electrical Supply Co., in defence of electric pumping, said they were perfectly willing to go into the whole thing on a fair basis—if they put an example to them where they had their Cornish engine, they would put down an electric pump against it. His impression was that in a great many cases electricity would come off best.

Royal Society of Arts.—The Council has awarded the Society's Silver Medal to the following among other readers of papers during the Session, 1908-9:—Mr. Walter Rosenhain, "The Application of the Microscope to the Study of Metals"; Herr Sam Eyde, "The Manufacture of Nitrates from the Atmosphere by the Electric Arc."

Society of Engineers.—The third vacation visit of the present session took place on Wednesday, when a party of members and associates of the society, with their friends, inspected the Greenwich generating station of the L.C.C.

Appointment Vacant.—Shift engineer for Greenock (£2). See our advertisement pages to-day.

Fire Prevention.—Last year the *Liverpool Courier* premises, and all the buildings occupied by Messrs. C. Tinling & Co., were fitted with the May-Oatway automatic fire detection system, this installation being connected with the Central Fire Station. Early on Sunday morning, the 4th inst., a fire occurred in the telephone room, the flooring catching fire, but, thanks to the efficiency of the system and the immediate warning given, the fire brigade were able to step in before more than trifling damage was done. The May-Oatway Co. inform us that this is their seventieth "save" in seven years, a fact of which they are justly proud.

An interesting demonstration of the efficiency of "Kyl-Fyre," a dry powder extinguisher, was arranged for Wednesday afternoon last, by Messrs. Wiggins & Rihll, of 7, Mark Lane, E.C. The "Kyl-Fyre" powder is supplied in a tube some 20 in. long, weighing about 6 lb., with a readily detachable cover, and one has only to look at the extensive list of users, including a score of electricity works, to realise its success. The mere fact of its being in powder, instead of liquid form, ensures that the damage shall be due to fire only, and not, as has frequently been the case, attributable largely to water.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—At a meeting of the Barnsley Town Council on Monday the E.L. Committee recommended that the salary of the electrical engineer, MR. ASHTON BREMNER, be increased from £350 to £400 per year. The recommendation was opposed by some of the members of the Council, and it was pointed out that the Committee had two years ago passed a resolution that in future all applications for increase of salary in connection with the electricity department were to be made in the month of February, so that they could be taken into consideration when the annual estimates were prepared. The Mayor thereupon ruled the Committee's recommendation out of order, and it was not proceeded with.

The Barrow Corporation has decided to increase the salary of MR. BARNWELL, works superintendent, from £155 to £165 per annum, and afterwards by annual increments of £5 to £185 per annum; and the salary of MR. HESLOP, mains superintendent, from £135 to £150 per annum, and afterwards by annual increments of £5 to £170 per annum. There was considerable discussion on the matter at the Town Council meeting, but Alderman Smith said the salaries were reasonable in proportion to the training and skill of the men.

MR. A. J. BROOKS has been appointed electrical station superintendent at Avonbank, Bristol, at £175 per annum, rising to £200 after six months' service, and then to £250 by two annual increments.

Torquay T.C. has granted MR. STOREY, electrical engineer, an honorarium of 100 guineas in appreciation of his services in connection with the laying down of the tramway plant.

Worksop (Notts.) U.D.C. decided on Monday to increase the salary of the assistant electrical engineer from £109 to £120 a year.

From among 220 applicants, MR. E. TAYLOR, of West Ham, has been selected for the post of fourth assistant engineer at the Hammersmith electricity works.

Tramway Officials—It has been arranged by the Bournemouth Tramways Committee that MR. F. T. OLDING (the present chief clerk) is to be relieved of all work other than traffic matters, and appointed as traffic superintendent, at his present salary (£200); MR. HARRY BAKER, the present official, is appointed cashier, at a salary of £175; MR. IGNATIUS BULFIN, the present electrical engineer, is appointed chief assistant to the general manager and electrical engineer at his present salary, £450; and MR. W. B. TAIT will continue to hold the position of works superintendent, at his present salary of £175.

MR. C. W. MALLINS, general tramways manager of the Liverpool Corporation, has had his salary increased by £100 per annum.

General.—The Derby Chamber of Commerce has appointed MR. HENRY DAVIS, of Messrs. John Davis & Son (Derby), Ltd., the well-known electrical engineering firm, to be its delegate at the seventh Congress of Chambers of Commerce of the Empire, which is to be held at Sydney, New South Wales, in September next.

NEW COMPANIES REGISTERED.

Gavan Inrig, Ltd. (103 894).—This company was registered on July 6th, with a capital of £2,000 in £20 shares, to acquire the business and assets of G. Inrig, of Great Eastern House, 20, Bishopsgate Street (Without), E.C., to develop and work the foreign patents granted to him for France, Belgium, Spain, Italy, Germany, Switzerland, Portugal, Canada and U.S.A., and to carry on the business of electrical and general engineers, manufacturers of insulating material and rubber substitutes, &c. The subscribers (with one share each) are:—G. Inrig, M.I.E.E., Aberleigh Lodge, Bexley Heath, Kent; G. Whatman, 2, Christie Road, South Hackney, electrical engineer. Private company. G. Inrig is the first managing director; remuneration, £300 per annum.

Walter Scott & Co. (Edinburgh), Ltd. (7,193).—This company was registered in Edinburgh on July 8th, with a capital of £500 in £1 shares, to acquire the business of electrical, mechanical and general engineers, carried on at 148, Rose Street, Edinburgh, as Walter Scott & Co. The subscribers (with one share each) are:—Walter Scott, 70, Elm Row, Edinburgh, engineer; D. M. Fraser, 29, Comely Bank Road, Edinburgh, engineer. Private company. The number of directors is not to be more than three; D. M. Fraser is the first; qualification, £25; remuneration as fixed by the company. Registered office, 148, Rose Street, Edinburgh.

E. M. Redfern, Ltd. (103,873).—This company was registered on July 5th, with a capital of £2,000 in £1 shares, to adopt an agreement with E. M. Redfern, and to carry on the business of electricians, electrical engineers, &c. The subscribers (with one share each) are:—E. M. Redfern, Grassmere, Upper Pershore Road, Selly Park, Worcs., engineer; F. C. Marvin, 88 Gillott Road, Birmingham, electrical engineer. Private company. E. M. Redfern is chairman and managing director for life; qualification, 100 shares. Registered office, 9, Ethel Street, Birmingham.

Premier Electric Institute, Ltd. (103,969).—This company was registered on July 9th, with a capital of £100 in £1 shares, to inaugurate an institute for selling curative electrical appliances and advising on electrical treatment, to carry on the business of manufacturers and dealers in electrical specialities, &c. The subscribers (with one share each) are:—A. Baker, 142, Ruskin Avenue, Manor Park, Essex, clerk; L. K. Brown, 30, Tournay Road, Walham Green, S.W., clerk. Private company. Table "A" mainly applies. Registered office, 139-5, Regent Street, W.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Metropolitan Amalgamated Railway Carriage and Wagon Co., Ltd. (73,480).—This company's annual return was filed on June 17th, when 949,808 ordinary, 249,132 "A" preference and 235,000 "B" preference shares had been taken up out of a capital of £1,675,000 in 1,000,000 ordinary, 400,000 5 per cent. "A" preference and 275,000 6 per cent. "B" preference shares of £1 each; £7 has been received and £1,432,933 is considered as paid. Mortgages and charges: Nil.

Electric Batteries and Carbons, Ltd. (97,710).—Debenture dated June 2nd, 1909, to secure £1,500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: R. G. Orr, End House, Cavendish Road West, N.W.

Wells, Rayner & Co., Ltd. (78,655).—This company's annual return, made up to April 13th, was filed on June 7th, when 3,450 ordinary and 2,006 first preference shares had been taken up (in addition to 2,550 ordinary shares surrendered to the company) out of a nominal capital of £20,000 in 4,000 first preference, 10,000 second preference and 6,000 ordinary shares of £1 each. £1,831 has been received on 2,006 first preference, leaving £175 in arrears; £6,000 is considered as paid on 6,000 ordinary shares (including those surrendered). Mortgages and charges: £1,000.

Solium Electrical Co., Ltd. (99,009).—Debenture dated July 5th, 1909, to secure £2,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holder, Nottingham and Nottinghamshire Banking Co., Ltd., Thurland Street, Nottingham.

British Aluminium Co., Ltd.—Mortgage dated June 28th, 1909, to secure all moneys due, or to become due, from the company to Parr's Bank, Ltd., charged on certain aluminium in course of transit.

Cowans, Ltd. (57,378).—A memorandum of satisfaction to the extent of £3,000 on May 4th, 1909, of debenture stock covered by trust deed dated February 26th, 1902, securing £5,000, notified July 5th.

CITY NOTES.

Bombay Electric Supply and Tramways Co., Ltd.

SIR EDWARD SASSOON, Bt., M.P. (Chairman), presided at the Electrical Federation Offices, Kingsway, on Tuesday, over the fourth ordinary general meeting of the above company.

In moving the adoption of the report (to which we referred in our issue of July 2nd), the CHAIRMAN said the net receipts amounted to £67,066, as compared with £40,880 in the previous year, being an increase of £26,186. After deducting the proportion of debenture interest, amounting to £24,592, there remained £42,474, to which had to be added the amount brought forward from the previous year, making an available total of £45,363. The preference dividend paid up to August 15th, together with the accrued dividend to December 31st last, amounted altogether to £35,978, which left a balance of £9,385 to be carried forward to the next account. The total revenue from all sources, including the amount represented by the sale of current to the tramways, was £177,855, an increase of £49,935, and this additional revenue was obtained at an increase in expenditure of £23,749. Dealing with the general conditions prevailing in India during the period under review, the chairman quoted from an article in the *Times*, and said that the effect of the trade depression had shown itself in a marked degree in Indian railway receipts, and had no doubt also reflected itself in the tramway receipts. They had also been prejudiced by the riots which occurred in Bombay. He thought it a cause of satisfaction that notwithstanding these unfavourable conditions they were able to come before the shareholders with an increase of receipts for both branches of the business, and given normal conditions the directors looked to a steady if not very rapid growth of the receipts now that the tramways had been entirely electrified. They were providing an excellent service, which compared favourably with the majority of the tramway systems of Europe, and this, coupled with the extension of the city, should result in steady progress. They were devoting particular attention to the ticket system, whilst traffic organisation had their unremitting attention. This year they were adding 10 cars to the rolling stock, making a total of 172. From January 1st to May 18th, a small portion of the lines continued to be worked by horse traction, and in consequence of their having to maintain a separate organisation for this service, the operating expenses of the horse section practically amounted to the receipts it earned. The power and running expenses of electric traction were last year somewhat higher than in the previous year, owing to the fact that they ran a considerably greater car-mileage, whilst the rate paid to the power section was raised. The total receipts from the electric supply amounted to £47,714, as compared with £21,566, whilst the working expenses amounted to £39,737, as compared with £19,545. On the face of it, the increase in the working expenses appeared somewhat out of proportion to the increase in the receipts, but this was accounted for by the fact that over 66 per cent. of the total units sold were sold to the tramways. The electric supply branch debited the tramways with the units at just about the cost of production, but, of course, this was reflected in the lower cost of generation in respect of the total number of units generated. There was nothing very material in it, because if they charged the tramways a higher price, it would be shown in the tramways expenses. The receipts, exclusive of the revenue represented by the current supplied to the tramways, amounted to £25,683, as compared with £17,707 last year; an increase of nearly

£8,000, and the board carried to profit and loss account £7,976, as compared with £2,021 in the previous year. Last year they added 215 consumers, representing 40,208 equivalent 8-C.P. lamps. The progress of the company had been well maintained in the current year, and up to the end of May they connected 135 new consumers, representing 20,629 equivalent 8-C.P. lamps. Having regard to their increasing business and with a view to lowering the cost of generation, they had completed arrangements for erecting a new generating station at Kussara Basin, but as the benefits which this would bring were fully explained in the report he had nothing material to add. Negotiations were in progress for the supply of power to the workshops of the Bombay and Beroda Railway Co., who would take a supply of about 500 KW., and other important contracts were being negotiated for, so that the supply might commence about the date of the completion of the new power station which they anticipated would be early in 1911. The capital expenditure of the year amounted to £232,482, which represented amounts payable under various contracts. The authorised capital of the company had now been issued, and in order to provide for the future capital expenditure contemplated, they made an issue recently of £150,000 5 per cent. mortgage debentures, which were underwritten in Bombay and London. These were to be redeemed in 28 years by annual drawings, commencing in 1913, and a fixed sum of £6,060 had been provided annually for the purpose. The directors had set aside £6,000 for the purpose of creating a sinking fund for the redemption of the 4½ per cent. debenture stock, and this sum, which was being separately invested, would appear in next year's accounts. The question of making proper provision for debentures was also receiving attention, and this, of course, would have to be made out of profits. The chairman proceeded to refer to the action taken in appointing a consultative committee in Bombay to advise the board on local matters, and to the retirement of Mr. E. Hopwood, the secretary, who had secured a post in the North of a more remunerative character, giving greater scope for his activities. Eulogistic references was made to Mr. Hopwood's loyal services to the company, and the wish expressed that he would be successful in his new post. In conclusion, the Chairman said he would like to refer to the foolish reports which had been circulated in India, presumably by unscrupulous and interested persons who were desirous of bearing the shares of the company. It was stated that (1) the company was going into liquidation; (2) that in addition to its debentures, the company was largely in debt; (3) that they were going to embark in enterprises outside of Bombay, and, indeed, outside India; (4) that the company was still not free to buy its plant and stores in the cheapest market; and (5) that it was dependent, in some degree, on the working and results of other electrical companies—the Brush Co., and other companies connected with the British Electric Traction Co. being specially mentioned in this connection. To all of these reports the board gave most emphatic contradiction. The past history of their undertaking had been one of uninterrupted progress, and its future prospects were most promising, whilst its financial position was sound and free from any embarrassment. Their net earnings that year were sufficient to pay the debenture interest and the preference dividend, and they looked forward before long to being able to pay a dividend on the ordinary shares.

SIR CHARLES OLLIVANT, K.C.I.E., seconded the motion, and the report was adopted without discussion.

The following particulars are given in the directors' report:—"The directors look forward to a steady increase in the tramway receipts now that the electrification of the system has been completed.

	Year ended Dec., 1907.	Year ended Dec., 1908.
Route miles opened	18·27 (avge.)	20·38
Number of passengers carried	25,766,916	30,486,666
Proportion of expenses to receipts	60·9 %	53·1 %
Electric cars in stock	84	102

"The gross receipts from electric supply for the year, including the amount represented by the sale of current to the tramways, amount to £47,714, as compared with £21,566 for the previous year. The receipts, exclusive of the revenue represented by the current supplied for the tramways, amount to £25,683, as compared with £17,707 for the previous year. The working expenses amount to £39,737, as compared with £19,545 for the previous year. The balance of £7,977, as a result of the year's operations, compares with a balance of £2,021 for the previous year.

"The following figures show the comparative results of the past three years:—

—	Consumers.	Equivalent of 8-C.P. lamps.	Units sold. For ltg. and pwr.	Units sold. For tramways.	Units sold. Total.	Revenue.	Expenses.	Balance.
						£	£	£
1906	330	18,849	531,731	—	531,731	8,435	10,075	1,640 (debit)
1907	588	84,648	1,238 661	823,246	2,056.907	21,566	19,545	2,021
1908	803	124,856	1,738,676	3,524,954	5,263,630	47,714	39,737	7,977

"In order to meet the increasing demand for the supply of electrical energy, and to reduce the costs of generation, the company have recently completed arrangements with the Trustees of the Port of Bombay for the lease of a piece of land having an area of about 17,737 sq. yd. for the erection of a new generating station at Kussara Basin. This site has recently become available owing to a reclamation which has been undertaken by the Port Trust. It possesses many important advantages over the existing one at Wari Bunder. At the latter the costs of generation are enhanced by the high cost of water for condensing, and the necessity, owing to its distance from the sea, of employing cooling towers for this purpose. The cartage of coal from the sea front is also a substantial enhancement to these costs. At Kussara, on the other hand, the situation will provide special advantages for an unlimited supply of sea water for condensing, and for the handling of coal either by boat or by rail. On its eastern boundary the new site has a landing wharf immediately on the Kussara Basin, while the new Port Trust goods railway is contiguous with its western boundary, and a siding from the latter will be provided into the property. In consequence of these and other advantages, the removal of the generating station will result in an important reduction in the company's generating costs; and future developments of the power house, for which there is abundant space, can, as the expansion of the business calls for them, be provided far more economically than would have been possible at Wari Bunder. The company have entered into a contract with the Brush Electrical Engineering Co. for the erection of the new generating station, and have placed an order with that firm for the supply of 4,000 KW. of additional steam plant. The company's existing generating plant at Wari Bunder, representing 4,800 KW. of plant, will also be transferred to the new power house, and it is intended then to dispose of the Wari Bunder lease and the buildings there. Before deciding on an extension of the existing steam generating plant, the directors very carefully considered the alternatives of adopting for this addition, oil or gas plant. After a full inquiry it was decided, having regard to the large size of the sets required, to uncertainties regarding the future price of oil fuel at Bombay, and to other considerations affecting the questions of reliability and economy of generation, that neither oil nor gas engines could at the present time be prudently adopted in substitution for steam plant at Bombay, but the directors are carefully watching the development of these other types of plant."

New General Traction Co., Ltd.

THE directors' report for the year ended March 31st, 1909, states that the revenue for the year, received and accrued from the various sub-companies, amounted to £18,701, against £18,893 in the previous year. The general expenses, including directors' fees and legal charges, amounted to £1,991, as against £2,509 in 1907-8. The accounts for the year show a small profit of £428, thus reducing the balance of loss previously shown, to £25,807. The dividend received from the Coventry Electric Tramways Co. for their year ended December 31st, 1908, was the same as for the previous year, viz., 3½ per cent., but owing to the general depreciation of trade, the result of the year's working only allowed of the sum of £2,000 being placed to reserve for depreciation, against £3,900 in the year 1907. The Norwich system showed no improvement for the year ended June 30th, 1908; but since that date certain changes have been made in the service and considerable economies effected in the working, and a better result for the current year is expected. The Douglas Southern Electric Tramways Co. paid 5½ per cent. on its preference shares for the year 1908, as compared with 6 per cent. for the preceding year. The income from the Philadelphia undertaking for the year amounted, under the terms of the lease, to £10,437, being an increase of £481 over the previous year. The directors' reports and accounts of the Coventry, the Norwich, and the Douglas Southern Tramway Companies respectively are annexed.

Baron Emile B. d'Erlanger presided on Tuesday, at the offices, 20, Bishopsgate Street, E.C., over the thirteenth annual meeting of the company.

The CHAIRMAN, in moving the adoption of the report, said it would only be necessary for him to detain them a short time, as the accounts were not at all complicated, and the items differed little, if anything, from those of the previous year. The receipts from the Coventry property for 1908 were exactly the same as for 1907; whilst those from Norwich were £913 less, and from Douglas £58 less. On the other hand, the Philadelphia property paid them £482 more than in the previous year, represented by the increased rate of interest on their shares in that undertaking for the second half of 1908; and the interest they received on the outstanding balances owing to them by the Coventry company on construction account, was £1,050, against £750. The result was that their receipts were practically the same as in the previous year, being, in fact, only £190 less. In addition to the income mentioned, however, they had also received out of the profits of the Coventry company for 1908, a further payment of £1,000 on account of the indebtedness of that company to the traction company, which payment would appear in the next year's accounts. Turning to the debtor side of the profit and loss account, they would see that the general expenses, &c., showed a reduction of £518, and interest on loans, a reduction of £356; the result for the year being that they had a small profit to show of £427. They had, since the date of the last annual report, disposed of a further amount of £5,000 of the bonds of the Darby Media and Chester Street Railway Co., which reduced the total amount of securities held by them as at March 31st last, to £643,248. He might say that since that date, they had realised yet further about £12,000 of those bonds, which had been sold at better prices than those previously obtained, viz., 95, and they trusted that they could be able presently to sell gradually further blocks of the bonds.

Under the terms of the trust deed for their 4 per cent. prior lien debentures, they had to commence amortising them by paying to the trustees on January 1st, 1910, £4,000, to be applied in redeeming those debentures at par by drawings. The receipts for the year from their various subsidiary companies, of which he had spoken, exhibited to them in a word their position. Coventry continued to make a fairly satisfactory profit; and as to Norwich Tramways, the directors of that company had for some time been hard at work, together with the manager, trying to devise some means by which the expenses might be reduced and the traffics increased, and he was glad to think that these efforts were bearing fruit, and they might now reasonably look forward to better results. With regard to Philadelphia, in accordance with the terms of the lease, they would receive an increased dividend at the rate of 1 per cent. from the 1st of the present month.

MR. FRANCIS FITZGERALD seconded the motion.

MR. JACKSON said that the Chairman had only given them the bare facts in the balance-sheet, and he suggested that in the future it would interest the shareholders if they gave the number of passengers carried on the various lines, and also the average takings. He would like to know whether the expenses of their undertakings were uniform per car-mile, and further, what the fees of the directors were. He noticed that the amount put down for light railways was £1,448 as against £1,973 last year.

MR. SOANES asked if the Philadelphia Rapid Transit Co. was a substantial company which could carry out its undertakings.

The CHAIRMAN said fuller information was not given because they had published the full balance-sheets of the Coventry and Norwich Tramways. In the Norwich undertaking they gave the number of passengers, and would do the same with the Coventry system next year. The cost per car-mile received the closest attention of the directors, and both at Coventry and Norwich it compared most favourably with that of other undertakings. The fees paid to the directors were £100 each. When he was asked to take charge of the company it was not in a flourishing condition, and he had done his best for it since. They had a certain number of bonds which were not pledged to the prior lien debentures, and as soon as they could get rid of a sufficient quantity they intended to pay off the floating debt on which they paid 6 per cent. The Philadelphia Co. had a capital of $30,000,000, and controlled all the tramways in Philadelphia. The difference in the amount put down for light railways was due to their having sold some shares.

MR. WINSLOW (engineer) said that the working costs per car-mile averaged 5½d. both in Coventry and Norwich. The receipts per car-mile were low in each town, between 7½d. and 8d.

British Electric Traction Co., Ltd.

THE thirteenth ordinary general meeting of this company was held on Thursday of last week at the Electrical Federation Offices, Kingsway, Sir Charles Rivers Wilson presiding.

In moving the adoption of the report (see ELECTRICAL REVIEW, July 2nd), the CHAIRMAN said that included with the report was a separate document giving particulars and statistics relating to the associated companies, from which it would be seen that a unique and economical organisation had been devised for the administration of about 60 undertakings. The Electrical Federation Offices, which had been built for their accommodation, were provided in the first instance by the British Electric Traction Co., and would be recouped either by way of principal, or in the shape of payments covering interest, sinking fund and repairs. The cost had been about £36,000, and after allowing for all charges in respect of the expenditure, there would be a saving upon the rents formerly paid. The building was on a 99 years' tenure. They would see from the statistics the magnitude of the work done, and a close study of the details could not fail to convince them that it had been done efficiently and economically. The enterprises in which they were interested had taken many years to develop, but the directors felt disappointed that the net result of the heavy work of the last 13 years had not been more profitable in recent years. They had always looked forward to the time when the undertakings would be able to show profits; but, unfortunately, they had fallen on bad times. The companies had been subjected to unnatural competition and opposition by the local authorities, with the result that they had had to submit to a gradual reduction in the fares, representing a loss of something like £200,000 per annum. At the present moment their difficulties were aggravated by the exceptional trade depression all over the country, such depression as he felt himself warranted in describing as the most severe and general the country had experienced since its adoption of Free Trade. If there were no profits there could be no creation of fresh capital, and without new capital there could not be an extension of enterprise. Dealing with the accounts, the revenue from the associated companies was about £33,000 less than in the previous 12 months, a large number of the companies having paid slightly reduced dividends. At Greenock the traffic receipts had fallen from £34,200 to £27,000; Hartlepool, from £15,500 to £12,300; in the Potteries they had decreased from £97,400 to £94,300, and many other undertakings showed a lower revenue than in the previous 12 months. In the aggregate the receipts of the Federated Companies showed an increase, but this was due to the increases at Auckland and Bombay, while in the case of the Metropolitan Tramways Co. additional lines had been opened. He hoped that with a revival in trade the receipts would go up. As to the current year, they had been able to hold their own, but unless there was a revival in trade before the end of the year he did not think there would be any material changes in the dividends of the associated companies. They had hoped to pay the reduced dividend of 3 per cent. on the preference shares as a regular half-yearly instalment, but the profits for the past year were £15,000 less than the amount required to pay such a rate of dividend. Unless the profits increased, it would obviously be unwise to pay the same dividend for the current year, and the directors were of opinion that unless profits materially increased, it would be wiser to suspend the payment of the dividend until the accounts had been made up for the year. The management and general expenses were £16,800, as compared with £24,100, the reduction being due to the fact that the Federation now bore items of expenditure which the company formerly met. As to the investments, the return of those which were remunerative was about ½ per cent. less than in the previous year, and the proportion of non-revenue-earning investments was larger, but he thought that was only temporarily. The average fare per passenger in 1908 was 1·23d., an improvement of ·02d. as compared with 1907, which represented £24,000, or six months' interest on the preference shares. In 1901 the average fare was 1·38d., and that meant an increase in revenue of no less than £200,000. The securities of the company appeared at cost in the accounts, and the time might come when it would be necessary to consider whether steps should be taken to deal with the matter. During the past year the directors had been considering the question of opening up electrical enterprises in other countries, and steps had to be taken with a view to securing a concession for tramways in St. Petersburg, accompanied by contracts for the construction of the work. A strong syndicate had been formed, in which the company had a substantial participation. Other negotiations were pending in regard to places abroad.

MR. EMILE GARCKE, in seconding the motion, referred to the Electric Lighting Acts (Amendment) Bill, which had been introduced by the Board of Trade into the present session of Parliament. He said it was impossible to read the Bill without feeling that it had been drafted with intent to prevent private enterprise from further engaging in electrical industries; and it applied not only to the future but to the companies already in existence.

MR. J. B. BRAITHWAITE suggested that steps should be taken to see if a new coin could be introduced worth about 1·15d., as it would enable a slightly higher fare to be charged, and so bridge over the loss which at present resulted on the tramways.

After further discussion, the CHAIRMAN, in reply to criticisms, remarked that suggestions had been made for reorganising the capital, but that meant a reduction in capital, and the board did not think that necessary. No further capital would be raised by the British Electric Traction Co. for the St. Petersburg undertaking.

The report was adopted.

A SHAREHOLDER, "W. F. P."—"who occupies a responsible position in the public service"—writes to the *Financial Times*, suggesting that, in the interests of shareholders of all classes, the Board of Trade make an investigation into the affairs of the above company, as provided for in Sec. 109 of the Companies' (Consolidated) Act, 1908. He remarks that the company has proved as speculative as any mining venture, and he continues:—"In 1899, when I first became a shareholder, the market value of the £10 preference share was 14⅜, and of the £10 ordinary 21⅞. To-day, after ten years' working, the prices of these shares are 2½ and ⅝ respectively, while no dividend is being paid on nearly £3,000,000 of ordinary and preference capital.

"The question of the absorption by this company of the Electrical Power Distribution Co., two directors of which were also directors of the British Electric Traction Co, calls for the strictest investigation. So also do the relations of the British Electric Traction Co. with the Brush Electrical Engineering Co. These two cases are simply cited as examples for inquiry. A Board of Trade inquiry is suggested, as officers, agents, and so forth of the company can be examined on oath. The Act requires that in the application to the Board of Trade one-tenth of the issued shares should be represented. Further, the Board of Trade may require the applicants to give security for the payment of the costs of inquiry, and in connection with this, although I am not a great shareholder in the British Electric Traction Co., still I am prepared to advance £100 to any security fund that may be formed for the purpose now suggested."

City and South London Railway Co.—The accounts for the half-year ended June 30th, show a balance, after providing for the debenture stock interest, the payment of dividend on the 5 per cent. preference stocks 1891, 1896, 1901 and 1903, and the transfer to renewal fund of £1,500, sufficient to allow of the payment of a dividend on the consolidated ordinary stock at the rate of 1¾ per cent. per annum, carrying forward £1,411. For the corresponding period last year, the dividend was at the rate of 1½ per cent. per annum, carrying forward £1,868.

Direct United States Cable Co., Ltd.—The board recommend a final dividend of 4s. per share, together with a bonus of 1s. per share, both free of income-tax, payable on 31st inst., making, with the three interim dividends already paid, a total distribution of 4¼ per cent. for the year ended June 30th, and after placing £5,000 to reserve fund account, carrying forward £3,596. The transfer books are closed from July 13th to 27th.

Electric and General Investment Co., Ltd.

The twentieth ordinary general meeting of the above company was held on Wednesday of last week, under the presidency of Mr. J. B. Braithwaite.

The Chairman, in proposing the adoption of the report, said that the past year had been one of comparative stagnation in electrical business, and therefore the company had not had the opportunities which it had had in former years of employing its capital to the extent which it would have liked. At the same time, it would be seen that the result of the year was that they had considerably reduced their liabilities. The profit for the year had amounted to £11,566, against £7,889, or very nearly £4,000 more, which was an increase of about 40 per cent. The directors proposed to pay the preference dividend, and they would then be left with a balance of profit to carry down of £4,095, against only £568 last year, so that there was a net improvement of over £3,500. That sum represented about 15 per cent. on the amount of capital paid up upon the ordinary shares, but looking at the continued depression in many of the electrical securities which were held by the company, he believed the directors would have the support of the shareholders in their proposal to transfer that amount to the contingency fund, which was a reserve against depreciation in the market value of their securities. Of course, if the market improved later on, that contingency fund might be drawn upon, if necessary, for dividend purposes, providing, of course, that the value of their investments in the market stood at a price which was equal to, or in excess of, the cost at which they stood in the books. As regarded the current year, it was a little early to say much, as they only commenced on June 1st; but, looking all round the market, he felt that, on the whole, he could say that there were indications of a slight improvement in business, and in all probability they would be able to present better results when he next had the pleasure of meeting them.

A discussion followed, and Mr. Croft expressed the opinion that the shareholders generally would be satisfied with the proposal of the directors as to dealing with the balance. He was speaking as a preference shareholder, but he thought that the view of all the shareholders would be that the course suggested was a prudent one.

Mr. Mathews said that he only held ordinary shares, and he thought that the directors might have used some of the profits to have paid a dividend to the ordinary shareholders on that occasion. The reserve and contingency fund now amounted to a very substantial sum, and he thought that they might have spared a little to have given the ordinary shareholders a dividend, however small.

Mr. Parker pointed out the desirability of maintaining a strong financial position looking at the depression which existed in electrical concerns.

The Chairman, in reply, pointed out that the ordinary shareholders had always recognised that that was a finance company, and they must therefore look for fluctuations in the dividend from time to time, but the ordinary shareholders had received already a return of £4 16s. per cent. on every £1 share, so that they had practically received their capital back five times over. With regard to the events of the past year, he considered that the London Electric Supply Bill had greatly improved the position of the electric light supply companies, and that an improvement in that class of security would set in in the future. He alluded to the unfair treatment which electric companies received at the hands of municipalities and various Government and local bodies, and pointed out that in London the omnibuses, the motors, the tubes and the underground railways upon which enormous sums of money had been expended, were being carried on with comparatively small returns, and he contended that it was utterly impossible for this state of things to continue to go on, and he trusted that municipalities would soon wake up to the position.

The report was adopted.

The Transition Period in Paris.

The reports of the original electric lighting companies in Paris, whose undertakings are being conducted on common account pending the definite assumption of sole control by the Compagnie de Distribution in the course of the next few years, are now being issued in relation to the first period of the stage of transition. In the case of the Compagnie Continentale Edison, the directors state that the extension of the cable network during 1908 was carried out at the expense of the Compagnie de Distribution, and the total amount of energy sold on behalf of the six Sectors, advanced from 45,311,000 kw.-hours in 1907, to 52,422,000 last year. A larger increase had been expected from the reduction in prices under the new *régime* of joint working, but the laying of the requisite new mains involved a considerable amount of work which was hampered by Continental strikes. The surplus on working obtained by the Edison Co. was £92,000, as compared with £136,100 in 1907, the diminution being attributed to the reduction in prices. On the other hand, the sale of buildings, mains and materials, which had already been written off, yielded £60,000, and the work of disposal has not yet been completed. The net surplus, including the balance brought forward, amounts to £168,400 as contrasted with £144,400 in 1907, and a dividend has been declared at the rate of £4 12s. per ordinary share, as against £4 in the preceding year, and £3 8s. on the founder shares, as compared with £2 16s. in 1907. The company holds 35,340 shares in the Compagnie de Distribution, which were subscribed for on the constitution of the latter. The Secteur de la Place Clichy, which is also one of the original companies, reports a financial year comprising 18 months, the working results of which are not comparable with any previous period owing to the changed conditions due to the course of the transition from the old to the new order of affairs. As net receipts the accounts show the sum of £72,000 for 1908, while the net profits total £37,000, thus enabling the payment of a dividend of 9 per cent., as in the previous financial year, on the share capital of £240,000. The installation account stands at £360,000, and although all the installations have been taken over by the city, and the price has not yet been determined, it is expected that it will not in any case be less than is represented by this sum. The company held shares of £140,000 in the Société Triphasé at the end of the year, and has since increased its investment by subscribing for the larger portion of the additional capital of £320,000 issued recently by the Triphasé Co., thus becoming the principal shareholder in the latter. On its part the Triphasé Co. is largely interested in the Compagnie de Distribution, and will survive the Secteur de Clichy, which is really a subsidiary of the former company.

General Electric Co., Ltd.

The report of the directors just issued reflects a very substantial improvement in net income during the year ended March 31st, 1909. In quoting from the report below, we have also added in parenthesis figures for the year ended March, 1908. The net trading profits and income from investments, &c., amount to £78,201 (£59,753); after deducting depreciation and debenture interest amounting to £26,987 (£25,030); there remains a balance of £51,213 (£34,723); out of which the dividend on the preference shares at the rate of 5 per cent. for the year ended March 31st, 1909, has been paid, absorbing £12,500 (£12,500); leaving an available balance of £38,713 (£22,223). This the directors recommend should be appropriated as follows:—Provision for managing directors' and employes' bonus, £3,871 (£2,222); provision for dividend on ordinary shares at the rate of 5 per cent. for the year ended March 31st, 1909, £18,697 (£18,026); to reserve account, £16,145 (£1,974). The reserve account stands in the accounts at £120,343 (£118,369), being the amount of undivided profits as at March 31st, 1908. The proposed appropriation of the undivided profit of the year ended March 31st, 1909, amounts to £16,145 (£1,974), giving a total of reserve account of £136,488. The result of last year's working can be considered satisfactory, in view of the prevailing depression in the engineering trades. The works of the company at Witton, Salford, Birmingham and London have been profitably employed throughout the year, although they have not been working up to their full capacity. The Osram metal-filament lamp has established during last year a great reputation. A considerable proportion of lamps recently supplied have been produced at the new works at Hammersmith, and the quality has proved in every respect equal to those supplied by the Continental factory. The company's telephone works at Salford have been considerably extended. Further ordinary shares to the number of 1,342 (1,466) have been allotted during the period covered by the accounts, to the directors and staff at par. Mr. H. Bevis tendered his resignation as director, which was accepted by the board. Mr. Ernest G. Byng retires, and offers himself for re-election.

National Telephone Co., Ltd.

The directors' report for the half-year ended June 30th, 1909, states that the income accrued in respect of the business of the half-year amounts to £1,546,838, as compared with £1,452,569 for the corresponding period of 1908, being an increase of £94,269. The working expenses for the half-year amount to £893,768, as compared with £828,969 for the corresponding period of 1908, being an increase of £64,798. The net result for the half-year (after deducting the Post Office royalties, amounting to £148,951) is a profit balance of £504,119, as compared with £484,069 for the corresponding period of 1908, being an increase of £20,050. The rentals carried forward for unexpired terms of running contracts amount to £1,366,283, as compared with £1,314,591 at the corresponding period of 1908, being an increase of £51,692. Out of the available balance of £379,850 shown by the net revenue account, the board will recommend the payment for the half-year of a dividend at the rate of 6 per cent. per annum on the first and second preference shares, 5 per cent. per annum on the third preference shares, 6 per annum on the preferred stock, and 6 per cent. per annum on the deferred stock, less income-tax in all cases. The board also propose to transfer £150,000 to the reserve fund account, and to carry forward the balance of £11,100. The sum of £313,394 has been expended on capital account during the half-year in the erection of 13,848 additional exchange and private stations, and in the construction of underground works.

United River Plate Telephone Co., Ltd.—The report for the year ended March 31st last, states that the gross receipts in sterling for the year in the River Plate were £287,064, against £250,750 for last year. Deducting expenses in Argentina and London, debenture interest, dividend on preference shares and interim dividend on ordinary shares, and adding interest on investments, transfer fees, &c., there remains a profit of £89,233, plus £4,904 brought forward, making an available balance of £94,138. After applying £32,000 to reduction of special replacement account and £25,000 to reserve, the directors recommend a final dividend of 5 per cent. on the ordinary share capital, making a return of 8 per cent. for the year, free of income-tax, that a sum of £2,000 be voted towards a staff provident fund, which is being formed among the company's employés in Argentina, and that the balance of £5,138 be carried forward. The board record the death of Mr. Alfred Le Rossignol, who had been for many years a director of the company.

Delhi Electric Tramways and Lighting Co., Ltd.

The third ordinary general meeting was held on Thursday, last week, at Winchester House, E.C.

Col. Sir Buchanan Scott, in moving the adoption of the report, dealt at length with the trouble which the directors had had with the contractors, who had the work of constructing the line at Delhi. The delay occasioned by the failure of the contractors in the completion of their contract had, he said, been most serious, and had handicapped the directors from the commencement of the company's operations. When the contractors failed, the company had to make arrangements themselves to do the work, and not only that, but they had to pay a large sum to get the materials released, which were seized by those who had claims on the contractors. The line was opened for traffic in June, 1908, and even then their troubles were not at an end, but continued during the five months of operation covered by the accounts. The receipts from both the tramway and lighting sections, and in particular the tramway system, were seriously affected by an unparalleled outbreak of malarial fever, which was so severe that between 60 per cent. and 70 per cent. of the population of Delhi were prostrated. The staff of the company also suffered. The receipts of the company, therefore, had not reached anything like the amount estimated in the prospectus. The gross receipts for the five months under review amounted to Rs. 67,500, and the total expenses to Rs. 55,600, leaving a total net receipt of Rs. 11,900, or £787. Negotiations were in progress for the sale of the original power station and plant taken over, and its replacement by more modern and efficient machinery, with a view to reducing the generating costs. It was very satisfactory to note that a new contract for street lighting upon improved terms, had been submitted to the company by the Delhi Municipality for approval, and the directors had every hope that a substantial revenue would be derived from that section in the future. The passengers carried on the tramways totalled 805,670, the car-miles run 142,755, and the average receipt per passenger was about 1d. Their latest advices from India showed that the receipts were increasing week by week. There had been a falling off during the cold weather, but that was only to be expected. The negotiations had been concluded for the issue of a number of debentures in India, which showed that the residents there thought well of the undertaking.

Mr. J. M. Campion, M.I.C.E., seconded the motion, and after a short discussion, the report was adopted.

North Melbourne Electric Tramways and Lighting Co., Ltd.

The directors' report for the year ended September 30th, 1908, says that the operation of the company's undertaking has been under the management of Messrs. J. G. White & Co., Ltd., during that period, and the directors have arranged with Messrs. White to continue the management for a further period of two years from June 1st, 1909. The results of the operation of the undertaking continue to be unsatisfactory, although there is some improvement in the results as compared with the preceding year. The profit and loss account shows a better position on the Melbourne operation, largely due to savings in the operating expenses, with an increase in the lighting business. The tramway receipts continue to show poor results. Negotiations have been continued with the Government for authority to make the connection with the Melbourne Tramways Co.'s undertaking at Flemington Bridge, and the Government has announced its intention to introduce a Bill in Parliament during the present session to authorise the extension. The company is extending its lighting system, and there is an improvement in this department. In view of the fact that it will probably take some years before the earnings of the undertakings will be sufficient to pay the full debenture interest and arrears, and the sinking fund, an arrangement was concluded in November last with the debenture-holders, whereby they deposited their debentures for five years with the United States Debenture Corporation, Ltd., and agreed that their security should not become enforcable, nor the principal moneys become payable, solely on account of their interest being in arrear during such period. The debenture-holders also assented to the amount of the interest which was payable December 1st, 1908, being retained by the company to be used for necessary extensions to the lighting system. The company is greatly indebted to the debenture-holders for the concessions made by them. It is hoped that this will give the company a reasonable period to develop its business and avoid the danger of foreclosure. Every effort is being made to economise in the operation. The directors have continued without their fees. Messrs. J. G. White and Co., Ltd., make no charge for office expenses and staff, other than actual out-of-pocket expenses, and the total London expenses, with the exception of interest and trustees' fees, amounted to only £42 for the past year.

The annual general meeting was held on Tuesday at 9, Cloak Lane, Cannon Street, E.C., Mr. Arthur F. Farish in the chair.

The Chairman having formally proposed the adoption of the above report, the motion was seconded by Mr. A. T. M. Johnson, who said that for 41 years he resided in Melbourne and knew well the position of the tramways. It was 19 years since he was in the city, and at that time the district was a little scattered, but still even then he considered there was a very fair opening for a tramway. The only drawback that he saw to the company's line was the close proximity of the railway which ran a few yards behind their main route, and the people had become so accustomed to travel by train that they were biased against anything in the nature of electricity. He was pleased to see that the accounts showed an improvement over last year, for they had not only paid their way, but had a balance of £1,500. He felt confident that in the course of the next two or three years the line would be a splendidly paying one, because it went through districts that must have electric tramways, and as soon as the people accustomed themselves to travelling, he felt sure the receipts would vastly improve.

Mr. Henriques asked the Chairman for some information as to the progress of the company during the year under review.

The Chairman said that the receipts on the tramways from passengers for the year ended September 30th, 1908, amounted to £12,577, as against £12,618 for the preceding year, and the total tramway receipts were £12,770, as compared with £12,919. In the lighting department they had done much better—the receipts having amounted to £1,828, as against £696. The total revenue from the tramways and lighting was £14,598, as compared with £13,600. The operating expenses were £13,046, against £14,857, showing a satisfactory decrease of £1,240. There was no doubt that Mr. Johnson had put his finger on the spot when he alluded to the competition of the railway, and the sooner the population took to the tramways the better. He was pleased to say that the Government had promised to introduce a Bill into Parliament during the present session to authorise them to make a connection with the Melbourne Tramway's undertaking at Flemington Bridge, and if that connection was made they hoped their traffics would greatly improve. From the manager's report they gathered that building operations were going on along the route of the trams, but in any event he was afraid it would be a long time before they could expect to be in the position they would like to be in regard to the company. Everything was being kept perfectly in order at a minimum of expense. Messrs. J. G. White & Co. were managing the tramways free of cost, and the directors and secretary were working without fees.

The report was then adopted.

Prospectuses.—*Fife Tramway, Light and Power Co., Ltd.*—The prospectus of this company shows that the authorised share capital is £200,000, divided into 125,000 6 per cent. cumulative preference shares of £1 each—£125,000; 75,000 ordinary shares of £1 each—£75,000. Subscriptions are invited for 109,700 cumulative preference shares of £1 each, conferring the right to a fixed preferential dividend at the rate of 6 per cent. per annum. The company has been formed to take over the construction, equipment and working of the tramways and other works authorised by the Dunfermline and District Tramways Order Confirmation Act, 1906, the production, supply and distribution of electricity for lighting, and all other public and private purposes within the Royal burgh of Dunfermline and parts of the county of Fife situated beyond the burgh. The tramways to be constructed at present extend to about 12 miles of single track over 9½ miles of route. It is intended to apply to Parliament for powers to construct a line from Dunfermline to the Rosyth Naval Base. Messrs. Hawtayne and Zeden, consulting engineers, London, estimate that the annual net earnings of the tramways, lighting and power properties should amount to £18,500; interest at 5 per cent. on, say, £80,000 debenture stock, is £4,000; dividend of 6 per cent. on £125,000 preference shares in £7,500, leaving £7,000. The registered office of the company is Commercial Bank Buildings, High Street, Dunfermline.

Bandar Sumatra Rubber Co., Ltd.—This company has been offering an issue of 94,000 shares of £1 each. The company is acquiring the Bandar Pinang Estate, in the Serdang District, East Coast of Sumatra.

Kamuning (Perak) Rubber and Tin Co., Ltd.—An issue of 775,000 "A" shares of 2s. each has been offered. The company is acquiring the Kamuning Estate, Perak, from Linggi Plantations, Ltd.

Oriental Telephone and Electric Co., Ltd.—The list is to close to-day in an issue of £50,000 4 per cent. redeemable debenture stock at 86. The proceeds are to be applied to assist the Bengal Telephone Co. in its undertakings, to repay temporary advances, and for general purposes.

Interborough Rapid Transit Co.—An issue of $10,000,000 5 per cent. 45-year gold mortgage bonds has this week been offered for subscription in London.

The Italian Thomson-Houston Co.—This company has recently completed the first monophase electric traction system which it has had occasion to carry out between Padova and Fusine, forming part of the secondary Italian railway system. The balance-sheet of the company to December 31st last, shows a net profit of 579,240 lire, say, £23,000, which, added to the balance brought forward from 1907, makes a total of 734,236 lire, say, £29,300; of this the shareholders receive 540,000 lire (£21,500); 28,962 lire are placed to reserve, 155,247 lire are carried forward, and the balance of about 10,000 lire goes to the directors.

Dublin and Lucan Electric Railway Co.—The directors recommend a half-year's dividend of 5 per cent. on the preference shares, placing £250 to reduction of electrical equipment (capital account), and carrying forward £420.

Hastings and District Electric Tramways, Ltd.—According to the *Financial Times*, the directors announce that they are not in a position to pay any interim dividend on the preference shares.

London Electric Wire Co. and Smiths, Ltd.—The directors announce an interim dividend for the half-year at the rate of 5 per cent. per annum.

Okonite Co.—An interim dividend of 2 per cent. has been declared.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight.		No. of wks.	Total to date.		Route miles open.	
		£	£*		£	£*		Inc.
Aberdeen	July 7	2,577	— 182	5	7,664	— 226	..	..
†Ayr	,, 10	675	— 42	8	2,462	— 166	8	..
Bath	,, 7	1,790	+ 65	27	19,294	+ 614	..	..
Belfast	,, 9	7,642	— 566	13	55,088	+ 1,784	37	..
Birkenhead	,, 11	2,389	+ 41	14	15,684	— 412	13·52	..
Birmingham Corp.	,, 3	13,122	+ 395	14	88,828	+ 650	..	..
Blackburn	,, 7	2,193	— 255	15	17,103	— 537	13·97	..
Blackpool-Fleetw'd	,, 10	2,386	+ 73	..	..	..	..	..
†Bolton	,, 4	2,546	— 147	14	32,755	— 700	26	..
Bournemouth	,, 7	3,096	— 163	14	23,327	+ 72	21·96	..
Bradford	,, 8	9,806	— 422	13	66,809	+ 931	54·9	..
Brighton	,, 11	1,989	+ 37	15	12,843	+ 733	9·5	..
Bristol	,, 9	11,846	—1,472	..	..	..	..	..
Brit. Elec. Trac. Co.								
Airdrie	,, 2	439	— 40	26	5,641	— 128	3·65	..
Barnsley	,, 2	320	— 38	,,	4,313	— 181	..	..
Barrow	,, 2	488	— 96	,,	5,642	— 446	5·37	..
Cavehill	,, 2	191	— 98	,,	2,005	— 252	..	..
Devonport	,, 2	644	— 402	,,	9,473	— 2,126	8·85	..
Gateshead	,, 2	2,081	— 245	,,	25,660	— 294	11·25	..
Gravesend	,, 2	434	— 57	,,	5,051	— 224	6·5	..
Greenock	,, 2	1,861	— 80	,,	13,541	— 155	7·25	..
Hartlepool	,, 2	502	— 66	,,	5,645	— 169	6·72	..
Kidderminster	,, 2	231	— 45	,,	2,473	— 182	..	..
Leamington	,, 2	393	— 12	,,	4,161	+ 141	..	..
Merthyr	,, 2	415	+ 2	,,	5,439	+ 21	2·9	..
Metropolitan	,, 2	12,691	— 766	,,	153,588	+11,926	22	..
Middleton	,, 2	675	— 283	,,	8 535	— 680	8·5	..
Mid. Joint Com'tee	,, 2	11,259	— 842	,,	143,646	— 4,071	..	..
Oldham—Ashton	,, 2	1,120	— 104	,,	14,329	— 1,062	9·13	..
Peterborough	,, 2	231	— 56	,,	2,808	— 254	5·31	..
Potteries	,, 2	3,672	— 52	,,	45,840	— 1,290	29	..
Rothesay	,, 2	195	— 184	,,	3 281	— 102	2·75	..
Southport	,, 2	661	— 110	,,	6,122	— 226	8·17	..
S. Metropolitan	,, 2	1,621	— 306	,,	19,501	— 389	..	..
Swansea	,, 2	1,947	— 108	,,	23,841	+ 488	12·5	..
Tynemouth	,, 2	673	— 156	,,	4,814	— 119	3·75	..
Weston-s-Mare	,, 2	574	— 88	,,	2,257	+ 139	3	..
‡Worcester	,, 2	590	— 67	,,	6,748	— 122	5·75	..
Wrexham	,, 2	199	— 23	,,	2,468	— 112	..	..
Yorks. Wool. Dist.	,, 2	1,816	— 151	,,	22 901	— 576	17	..
Miscellaneous	,, 2	436	— 76	,,	5,083	— 29	..	..
Burnley	,, 10	2,604	— 47	..	..	..	..	..
Burton-on-Trent	,, 11	543	— 29	15	3,939	— 96	6·62	..
Bury	,, 11	2,465	+ 2	14½	17,672	— 464	22·5	..
Cardiff	,, 3	4,325	— 465	14	29,425	— 904	..	..
Carlisle	,, 10	401	— 31	27	4,383	— 141	..	..
Chatham and Dist.	,, 8	1,648	— 104	27	20,757	+ 1,044	14·98	·61
Cork	,, 8	1,160	..	27	11,127	— 937	..	..
Croydon	,, 2	2,886	— 279	..	20,096	— 65	11·25	4·75
Darlington	,, 10	575	— 82	14	2,787	— 182	..	..
†Darwen	,, 2	247	— 41	13	3,401	— 146	4·56	..
Dover	,, 3	406	— 66	14	2,710	— 266	4·75	..
Dublin	,, 9	11,533	— 935	..	..	..	54·25	..
Dundee	,, 7	2,415	— 94	7½	9 000	— 383	15	..
East Ham	,, 10	2,060	+ 188	14½	14,7.0	+ 2,171	8·43	·68
Exeter	,, 9	679	— 23	15	5,184	+ 560	5·5	..
Glasgow	,, 10	33,846	—1,4'0	..	100,629	— 1,878	80·5	1·5
Hastings	,, 8	2,076	— 192	..	..	..	..	..
Huddersfield	..	..	..	..	..	..	..	..
Hull	,, 10	5,157	+ 271	14	36,001	+ 424	18	..
Ilkeston	,, 7	281	— 12	14	1,873	— 149	..	..
Ipswich	,, 10	850	— 60	15	5,691	— 25	10·5	..
Kilmarnock	,, 3	293	— 21	7	1,040	— 67	4·25	..
Lan'kshire Trm. Co.	,, 8	2,7·8	+ 46	27	33,167	— 1,810	17·62	1·18
Lancashire United	,, 7	3,586	+ 884	27	35,282	+ 171	..	..
Leeds	,, 3	14,355	— 216	14	92,558	+ 3,270	96·75	·25
Leicester	,, 3	4.545	— 107	..	..	..	..	..
Leith	,, 8	1,204	— 8	7	4,320	+ 317	6	..
Liverpool	,, 3	22 129	— 707	26	277,441	— 3,605	104	..
†L.C.C.	June 26	78,004	— 81	..	449.661	+19,311	121	4·25
London United	July 10	18,534	—2,232	..	158,093	—15,257	..	..
†Lowestoft	,, 8	190	— 32	40	5,897	— 666	3·5	..
Manchester	,, 10	32,507	+ 958	15	221,901	— 466	90·5	6
Newcastle	,, 10	7,256	—1,700	..	57,822	— 1,246	..	..
Newport	,, 10	1,355	— 65	15	9,915	— 261	14·5	..
Oldham	,, 11	3,729	— 150	15	29,520	— 1,827	23·75	..
†Pontypridd	,, 3	390	+ 61	13½	5,838	+ 1,005	5·5	1·75
Portsmouth	..	..	..	..	..	..	..	..
Preston	,, 7	1,478	— 101	..	..	..	..	..
Rotherham	,, 8	1,106	— 62	14	8,626	— 232	10	·66
Salford	,, 5	9,439	— 710	13⅝	64,000	— 2,271	..	..
Sheffield	,, 11	11,217	— 52	15⅞	87,055	— 1,302	37	1·25
Southampton	,, 6	2,195	— 108	14	14,813	— 465	..	..
Southend-on-Sea	,, 7	1,080	+ 84	14	6,708	+ 972	..	..
South Shields	,, 10	1,126	— 11	14⅞	8,181	— 55	..	..
Swindon	,, 7	260	— 52	..	..	..	..	..
Tyneside	,, 7	1,059	— 99	..	..	..	..	..
Wallasey	,, 8	1,909	— 88	13½	13,670	+ 353	..	·22
Walthamstow	,, 10	1,342	— 102	15	9,992	+ 161	9	..
West Ham	,, 1	4,739	— 34	13	31,392	+ 1,732	15	·3
Wolverhampton	,, 7	1,552	— 212	14	11,410	— 720	12·5	..
Baker St.-Waterloo	,, 10	6,575	— 515	26	81 860	+ 7,710	6·25	..
Cen. London Rly.	,, 10	11,253	—2,975	26	144,758	—18,554	6·32	·55
Char. +, Eus. Hamp.	,, 10	7,870	+1,185	26	101,120	+16,450	7.75	..
City & S. Lon. Rly.	,, 11	6,445	+ 159	26	84,602	+ 1,514	7·3	..
Dublin-Lucan Rly.	,, 9	303	— 14	26	3,220	+ 252	7	..
G.N. and City Rly.	,, 10	2,715	— 239	26	38,716	— 4,607	3·5	..
G.N., P'ty. & Brmin.	,, 10	11,325	+ 625	26	150,765	+ 9,775	9·25	..
L'pool Overh'd Rly.	,, 11	2,982	+ 78	..	..	..	6·3	4·3
Llandudno-Col. Bay	,, 2	741	— 42	31	5,597	+ 1,569	..	..
Mersey Railway	,, 10	3,883	+ 257	26	51,219	+ 1,609	4·5	..
Metropolitan Rly.	,, 11	38,589	+1,051	26	419,007	+14,215	24·5	..
Met. District Rly.	,, 10	20,691	+2,081	26	268,578	+25,066	34	..
Anglo-Argentine	,, 8	76,684	—3,716	..	1,059,186	+60,811	..	..
§Auckland	June 18	14,218	+3,180	24	83,101	+11,794	22·3	3·1
Bombay (B.E.T.)	,, 10	4,921	+ 160	22	58,625	+ 3,404	..	..
§Brisbane	,,	15,480	+2,120	..	..	..	..	..
Calcutta	July 10	7.008	+ 966	..	..	..	..	..
§CapeElectricT.Ltd.	June	11,208	..	..	..	..	..	..
§Kalgoorlie, W.A.	,,	4,008	..	26	23,859	..	20·5	..
Madras	,, 30	1,185	— 75	26	15,061	— 20	..	..
§Melbourne	..	..	..	..	..	..	..	..
§Lisbon	..	..	..	..	..	..	..	..
Perth (W.A.)	July 9	2,687	— 122	27	38,734	+ 78	28	2·4

* Compared with the corresponding period of 1908. † One week only.
‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Afternoon.

MONEY continues to be remarkably cheap, and a fall in the Bank Rate at an early date is confidently anticipated. The languor of summer, however, is beginning to tell upon business, in spite of the weather, and there is very little doing in any save a few departments.

Railway prophets are at work upon dividend estimates, and next week will see the first of the declarations from the trunk lines. The City and South London announces 1¾ per cent., an advance of ¼ per cent., and the result is a rise of ½ in the price to 31½. The Metropolitan, it is thought, will improve upon its recent performances. The Central London statement is awaited without enthusiasm, and the prices of the Ordinary and Deferred stocks continue to shrink, the latter being 2 points down at 44.

Metropolitan reacted ¼, but Districts made further upward progress. The Tube Debenture stocks are all very firm, and Underground Electric Railway prior lien bonds are ½ better.

British Electric Tractions continue flat, both the Debenture stocks are down 2 points. M. Emile Garcke's letter to the newspapers, appealing for a combined effort to induce Parliament to ameliorate the conditions of electrical supply companies, has been read with polite interest. Brush issues are unchanged. London United Trams are also without alteration. Anglo-Argentine Tramways First Preference shares are, of course, extinguished now, but the Second Preference show a slight fall, and the Third Preference are quoted 4 5/16. The 4 per cent. Debenture stock has hardened.

Calcutta Electric Supply shares came down with a run, from 6 to 5⅛, recovering again to their former figure. The movement had a singular cause. The company is about to issue more Preference capital, and invited shareholders to underwrite the new shares at a commission of 3 per cent. Apparently this thoroughly alarmed some of the proprietors, who, it is clear, failed to realise in the least what it meant. They seemed to think it a sort of confession of weakness. Instead of being glad to have the opportunity offered them to underwrite the new issue, they hastened to sell their old shares, and knocked the price down in the manner described. The incident is certainly amusing; to those in charge of new issues it may prove instructive.

The new-issue market is, at the moment, concerned mainly with rubber companies. These pour out in greater volume than even roller-skating propositions, though it is hardly fair to mention the two classes of industry in the same sentence. Some of the rubber companies are achieving remarkable success. The subscription lists of the Kamuning (Perak) Rubber and Tin Company were closed on Monday, a few hours after opening, and the issue was applied for many times over. The 2s. shares went to nearly 100 per cent. premium straightaway. Other rubber shares are firm, and notwithstanding the fact that a large speculative position is open for the rise, the market looks strong enough, although it will naturally be susceptible to violent fluctuations.

Electricity supply shares are steady, but featureless. Charing Cross Preference and City Lights Preference are ⅛ better, these being the only London shares to show any change.

The South American Traction group is generally easier. Mexican Light and Power Common fell 2, and the Preference reacted the same amount after its substantial advance of a week ago. Mexico Trams have held their rise pretty firmly, but there is an easing-off in others of this section. Business is rather quieter. River Plate Electricity Ordinary and Preference fell away a little.

National Telephones further rallied upon consideration of the dividend statement. The Preference shares are better, too. United River Plate Telephone Preference picked up ½ upon a capital report. Telegraph descriptions lack animation. Anglo-American stocks are a little irregular. West India and Panama fell 1/16. Globe Telegraph and Trust Preference have come into demand, and the price gained 7s. 6d., while buying from the States led to a point rise in Submarine Cables Trust certificates.

Stock Exchange Notices.—Applications have been made to the Committee to allow the following securities to be quoted in the Official List:—

United Electric Tramways of Monte Video, Ltd.—Further issue of 12,800 ordinary shares of £5, fully paid, Nos. 147,201 to 160,000, and 2,777 6 per cent. cumulative preference shares of £5 each, fully paid, Nos. 76,501 to 79,277.

Gateshead and District Tramways Co.—13,500 ordinary shares of £10 each, fully paid, Nos. 1 to 37, 41, 43 to 2,227, 2,232 to 5,121, 5,123 to 6,957, 6,975 to 6,994 and 6,997 to 13,523.

Telegraph Construction and Maintenance Co., Ltd.—The directors have declared an interim dividend of 12s. per share, free of income-tax, for the past half-year.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations July 6th.	Closing Quotations July 13th.	Business done week ended July 13th, 1909. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
			Nil	Nil	Nil	Nil						Nil.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	Nil	2⅜ — 3⅛	2⅜ — 3⅛	..	..	..	
126,700	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	5 %	5 %	5 %	5 %	92 — 96 xd	92 — 96	..	..	..	5 4 2
$121,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7½%	8 %	8 %	8 %	143⅜—144½	143½—144½	..	..	..	5 10 9
$18,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 58,001 to 78,000	$1000	4 %	4 %	4 %	4 %	97 — 99 xd	97 — 99	..	..	..	4 0 10
558,460	Anglo-American Telegraph	Stock	8½%	8½%	8½%	£3 4s.	57 — 59	57 — 59	..	..	..	5 9 8
3,220,770	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	100 —101	100½—101½	101½	100	+ ½	5 18 3
3,220,770	Do. do. do. Deferred	Stock	½%	1½%	1 %	8/-	15⅝— 16	16 — 16½	16⅜	16	+ ½	2 8 0
47,725	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	102 —104	102 —104	..	..	..	4 16 2
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	8 — 8⅜	8 — 8⅜	..	..	..	4 15 6
2,431,350	Commercial Cable, Sting. 500 year 4% Deb. Sk. Red.	Stock	5 %	5 %	6 %	6 %	89 — 91	89 — 91	90	89½	..	4 7 11
16,000	Cuba Telegraph	10	10 %	10 %	10 %	10 %	8¼ — 8⅞	8½ — 8⅞	..	..	..	6 15 0
6,000	Do. 10 % Pref.	10	4 %	4 %	4 %	4 %	17 — 18	17 — 18	..	..	..	6 11 1
12,981	Direct Spanish Telegraph, Ord.	5	10 %	10 %	10 %	10 %	2⅞ — 3⅛	2⅞ — 3⅛	..	..	..	5 3 8
6,000	Do. do. 10 % Cum. Pref. ..	10	4 %	4 %	4 %	4 %	8¼ — 8⅝	8⅛ — 8½	8⅝	..	..	5 12 8
20,000	Do. do. 4½ % Debs.	20	4½%	4½%	4½%	4½%	99 —101 xd	99 —101 xd	..	..	..	5 16 8
60,710	Direct United States Cable	100	4½%	4½%	4½%	4½%	128— 132	128— 132	129	127½	..	6 8 5
43,500	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	Stock	7 %	7 %	7 %	7 %	127 —130	127 —130	..	..	..	4 9 1
4,000,000	Eastern Telegraph, Ord. Stock	100	8½%	8½%	8½%	8½%	85⅛— 87½	85⅛— 87½	86	..	..	5 7 8
2,000,000	Do. 5½ % Pref. Stock	100	4 %	4 %	4 %	4 %	104½—106½	104½—106½	..	..	..	4 0 0
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	7 %	7 %	7 %	7 %	11⅛— 12	11⅛— 12	11⅛	11⅛	..	3 15 2
800,000	Eastern Extension, Australasia, and China Tele	10	4 %	4 %	4 %	4 %	102⅛—104½	102⅛—104½	..	..	..	5 16 8
752,400	Do. 4 % Deb. Stock	Stock					100 —102	100 —102	..	..	..	3 16 7
200,000‡	East. & S. Afric. Tel., 4 % Mt Db. Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	101— 103	101— 102	103	101½	..	3 18 5
181,127	Globe Telegraph and Trust	10	5½%	5½%	5½%	5½%	12½— 13⅛	13— 13⅜	13½	13⅛	+ ⅛	5 7 0
181,127	Do. do. 6 % Pref.	10	6 %	6 %	6 %	6 %	25½— 26½ xd	26— 26½	26⅜	25⅞	..	4 7 8
150,000	Great Northern Telegraph, of Copenhagen ..	100	24%	20 %	20 %	18 %						6 17 2
10,000	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	99 —101 xd	99 —101	..	..	..	4 9 1
17,000	Indo-European Telegraph	25	18 %	18 %	18 %	18 %	51½— 53½	51¼— 53½	52½	51½	..	6 1 6
$41,380,400	Mackay Companies Common	$100	2 %	3½%	4 %	4 %	80 — 84	80 — 84	..	..	..	4 15 3
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	74 — 79	74 — 79	..	..	..	5 5 3
894,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	2⅜— 2⅞	2⅜— 2⅞	16/9	15/-	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	5 %	6 %	6 %	6 %	1— 1⅛	1— 1	..	..	..	6 0 0
86,493	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	1⅛— 1⅜	1⅛— 1⅜	..	..	..	5 12 11
2,925,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	107⅜—109	108 —109½	109	108⅜	+1	5 9 7
2,725,000	Do. do. Def. Stock	100	5 %	5 %	6 %	6 %	123 —124	124 —126	125½	123	+2	4 15 8
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½— 11	10½— 11	..	..	..	6 9 1
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	6 %	10 — 10⅜	10½— 11	10⅜	..	+ ⅛	6 9 1
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	10	5 %	5 %	5 %	5 %	5⅛— 5⅜	5⅛— 5⅜	..	..	+ ⅛	4 6 0
9,000,000	Do. do. 3½ % Deb. Stock Red. ..	5	3½%	3½%	3½%	3½%	97 — 99	97 — 99	98	97½	..	3 12 2
1,983,593	Do. do. 4 % Deb. Stock Red.	Stock	4 %	4 %	4 %	4 %	99 —101	99 —101	..	..	..	3 19 3
179,818	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	100	7 %	7 %	8 %	8 %	1⅛— 1⅜	1⅛— 1⅜	..	..	..	5 6 8
50,000	Do. do. do. 6 % Cum. Pref. ..	1	6 %	6 %	6 %	6 %	1⅛— 1⅛	1⅛— 1⅛	..	..	..	5 1 1
99,100	Do. do. do. 4 % Red. Deb. Stock ..	1	4 %	4 %	4 %	4 %	86 — 88	86 — 88	87½	87⅛	..	4 10 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	100	4 %	4 %	4 %	4 %	99 —101 xd	99 —101	..	..	..	3 19 3
11,889‡	Reuter's	10	5 %	5 %	5 %	5 %	⅞— 1	⅞— 8⅛	7⅞	..	..	4 18 9
145,955	Telephone Co. of Egypt, 4½ % Deb. Red.	8	5 %	5 %	5 %	5 %	98½—100½ xd	98½—100½	..	..	..	4 9 7
3,042	Submarine Cables Trust	100	4½%	4½%	4½%	4½%	129 —132	129 —132	130	..	+1	4 10 11
120,000	United River Plate Telephone	Certs.	6 %	6 %	6 %	6 %	6⅛— 7⅛	6⅛— 7⅛	7	..	..	5 12 8
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	8 %	8 %	8 %	..	6⅛— 7⅛	6⅛— 7⅛	..	..	+ ⅛	4 13 0
80,008	W. Coast of America, 1 to 80,000 & 58,001 to 68,008	5	5 %	5 %	5 %	5 %	4⅛— 5⅛	5 — 5⅛	..	..	..	4 10 11
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Bras. Sub. Tel.	10	2½%	2½%	2½%	..	1⅛— 1⅜	1⅛— 1⅜	..	..	..	3 19 3
207,990	Western Telegraph, Ltd., Nos. 1 to 207,990 ..	100	4 %	4 %	4 %	4 %	99 —101 xd	99 —101	..	..	..	5 0 0
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	13⅜— 13⅝	13⅜— 14	13⅝	13⅜	+ ⅛	3 17 8
88,331	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	101 —103	101 —103	102	..	+ ⅛	Nil
84,568	Do. do. 6 % Cum. 1st Pref.	10	5 %	8 %	6 %	6 %	⅞— ⅞	1— 1	10/7½	..	+ ⅛	6 17 2
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	£2 6	15 %	8½— 8⅝	8½— 8⅝	..	..	..	17 2 4
80,000‡	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	8 — 9	8 — 9	..	..	..	4 17 7
							100½—102½	100½—102½	..	..	..	

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

220,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,007	5	8 %	8 %	9 %	10 %	9½— 9¾	9⅞— 9⅞	9⅝	9⅝	—⅛	9 6 1
978,280	Do. 4 % Deb. Stock	..	..	..	..	..	90½— 91½	91 — 92	91½	91	..	4 6 6
332,387	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	101 —103	101 —103	..	..	..	4 17 1
300,000	Babcock & Wilcox, 1 to 580,000	1	20 %	20 %	20 %	20 %	4½— 4⅝	4½— 4⅝	87/6	85/7½	..	4 11 1
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1⅜— 1½	1⅜— 1½	..	..	..	4 0 0
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	7 %	1— 1	⅞— ⅞	7/6	6/3	—	60 0 0
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	1½— 2½	1— 1⅛	35/-	30/-	—	46 2 1
40,100	Do. do. "A" 6 % Cum. Pref. ..	5	6 %	6 %	6 %	6 %	2½— 3½	2½— 3½	63/9	62/6	—1½	8 11 5
12,897	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3 — 4	2½— 3½	..	..	—	6 14 3
124,400	Do. do. 5½ % Loch Leven Debs. ..	100	..	5½%	5½%	5½%	94 — 99	94 — 99	..	..	..	5 11 1
500,000	British Columbia E. Rail Def. Ord. Stock ..	100	6 %	6 %	8 %	8 %	142 —146	143 —147	146	145½	..	5 9 7
400,000	Do. Pref. Ord. Stock	100	5 %	5 %	6 %	6 %	121 —124	121 —124	123	..	..	4 16 9
400,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	110 —113	110 —113	..	..	..	4 8 6
400,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250 ..	40	4½%	4½%	4½%	4½%	102 —104	102 —104	103½	..	..	4 6 7
238,000	Do. 4½ % Vancouver Power Debs., 1 to 2,900	100	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 5 9
212,600	British Electric Traction	10	3 %	Nil	Nil	..	⅛— ¼	⅛— ¼	15/-	11/3	..	Nil
428,000	Do. do. 6 % Cum. Pref.	10	6 %	6 %	6 %	6 %	2⅜— 2⅝	2⅜— 2⅝	51/10½	50/-	..	10 18 2
161,497	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	88 — 92	86 — 90	90½	88	—2	5 11 1
1,478,658	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	68 — 71	66 — 70	..	..	—2	6 6 7
628,986	British Insulated and Helsby Cables	5	8 %	10 %	10 %	10 %	7⅜— 7⅝	7⅜— 7⅝	7⅞	7⅛	..	6 9 0
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6⅛— 6⅝	6⅛— 6⅝	6⅞	6⅛	— ⅛	4 10 7
100,000	Do. do. 4½ % 1st Mort. Deb. Red. ..	100	4½%	4½%	4½%	4½%	103 —106	103 —106	105	..	..	4 4 11
600,000	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	91 — 96	91 — 96	..	..	..	4 18 11
804,941‡	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	Nil	⅜— ⅞	⅜— ⅞	..	..	..	Nil
400,000	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	4 %	38 — 42	38 — 42	..	..	..	9 10 6
1,016,858	Brownett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	⅝— ¾	⅝— ¾	..	..	..	Nil
60,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	Nil	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
50,000	Brush Electrical Engineering, Ord., 1 to 105,721 ..	2	2½%	Nil	Nil	Nil	0 — ½	0 — ½	..	..	..	Nil
140,978	Do. do. Non-cum. 6 % Pref.	2	6 %	Nil	Nil	Nil	0 — ½	0 — ½	..	..	..	Nil
200,000	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	43 — 48	43 — 48	..	..	..	8 6
125,000‡	Do. do. 4½ % Perp. 2nd Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	27 — 31	27 — 31	..	..	..	14 10 2
125,000‡	Do. do. 4½ % Perp. 2nd Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	4⅜— 4⅝	4⅜— 4⅝	..	..	..	6 5 4
187,610	Calcutta Trams, 1 to 187,610	5	8 %	8 %	6 %	5 %	4⅜— 5	4⅜— 5	..	..	..	5 0 0
45,804	Do. 5 % Cum. Pref., Nos. 1 to 29,980 ..	5	5 %	5 %	5 %	5 %	97 —100½	97 —100	..	..	— ⅛	4 13 0
850,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	9½— 10⅛	9½— 10⅛	10⅞	9½	..	7 2 10
85,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	..	5⅛— 5⅜	5⅛— 5⅜	..	..	..	4 15 8
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	103½—105½	104 —106	..	..	+ ⅛	4 4 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	1⅜— 1⅝	1⅜— 1⅝	..	..	..	Nil
491,223	Do. do.	1	Nil	Nil	Nil	..	1⅝— 2	1⅝— 2	39/4½	37/9	..	6 0 0
450,000	Cape E. Trams., 1 to 450,000	1	6 %	8 %	12 %	..	103 —106	103 —106	105	..	..	4 4 11
210,158	Casimer-Kellner Alkali, 1 to 450,000	100	4½%	4½%	4½%	4½%	61 — 64	61 — 68	68	61½	—1	5 3 2
1,890,690	Castner-Kellner Alkali, 1 to 450,000	Stock	4 %	4 %	8 %	8½%	82 — 86	83 — 85	84½	84	..	4 14 2
554,655	Central London Railway, Ord. Stock	Stock	4 %	4 %	4 %	4 %	43 — 47	43 — 45	45	30½	—2	5 11 1
554,655	Do. do. Def. do.	Stock	4 %	4 %	2 %	2½%	30½— 31½	31 — 32	..	..	+ ½	4 13 9
1,480,000	City and South London Railway	Stock	1½%	1½%	3½%	1½%	1 — 1½	1 — 1½	..	..	..	9 7 6
85,000	Crompton & Co., Nos. 1 to 85,000	8	2½%	5 %	5 %	5 %						
100,000‡	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	91½ — 94½	91 — 94	..	..	— ½	5 6 5

* Unless otherwise stated, all shares are fully paid † A period of nine months. ‡ From Manchester Share List

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(Continued.)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(Continued)

Present Issue.	NAME.	Stock or Shares.	Dividends for the last four years. 1905.	1906.	1907.	1908	Closing Quotations July 6th.	Closing Quotations July 13th.	Business done week ended July 13th, 1909. Highest	Lowest.	Rise or Fall —	Present Yield per cent. £ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1 1/16 — 1 1/8	1 1/16 — 1 1/8	..	..	..	8 0 0
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1 3/16 — 1 5/16	1 3/16 — 1 5/16	..	..	..	4 16 0
271,080	Do. do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 8 3
60,000	Dublin United Trams. (1896), 6 % Pref., 1 to 60,000	* 10	6 %	6 %	6 %	6 %	13 — 14	13 — 14	..	..	..	4 5 9
99,261	Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261	5	4½%	4½%	2½%	..	1/4 — 3/8	1/4 — 3/8	..	..	..	15 0 0
17,189	Do. "A" shares, 01—017,189	5	4½%	4½%	2½%	..	1 1/8 — 2 1/8	1 1/8 — 2 1/8	..	..	..	5 0 0
307,895	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	70 — 75	68 — 73	..	..	..	5 9 7
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	..	84 — 87	84 — 87	..	..	..	5 12
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	1/8 — 3/16	1/8 — 3/16	..	..	..	Nil
81,890	Do. do. 7 % Cum. Pref., 1 to 81,890	2	7 %	7 %	7 %	7 %	1 1/16 — 1 1/8	1 1/16 — 1 1/8	..	..	..	8 7 2
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	..	7 1/8 — 7 3/8	7 1/8 — 7 3/8	..	..	..	6 13 4
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	85 — 88	85 — 88	..	..	..	4 10 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	1 %	Nil	3/4 — 1	3/4 — 1	..	..	..	6 13 4
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10 1/4 — 10 3/4	10 1/4 — 10 3/4	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103	102 —103	..	..	..	4 16 10
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15%	15 %	15%	15 %	11 1/8 — 12 1/8	11 1/8 — 12 1/8	11 1/8	..	+ 1/8	6 5 0
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	5 — 5 1/8	5 — 5 1/8	..	..	..	4 3 9
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	105 —107	105 —107	105	..	..	4 4 1
50,000	India-Rubber, Gutta-percha & Telegraph Works	10	10%	10 %	10 %	..	14 1/2 — 15 1/2	14 1/2 — 15 1/2	15 1/16	14 1/2	..	6 11 2
87,500	†Liverpool Overhead Railway, Ord.	10	Nil	Nil	1/2 %	Nil	7/8 — 1 1/16	7/8 — 1 1/16	..	..	..	Nil
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	5 — 6	5 — 6	..	..	..	8 6 8
600,070	London United Trams. (1901), 1 to 50,007	10	3 %	3 %	3 %	Nil	1 1/2 — 2 1/2	2 — 3	..	..	..	4 8 11
899,980	Do. do. 50,008 to 100,000	10	3 %	3 %	3 %	Nil	3 — 4	3 1/2 — 4	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	3 2/3 %	1 1/2 — 2 1/2	1 1/2 — 2 1/2	..	..	..	15 5 7
1,381,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	63 — 67 xd	63 — 67	64 1/2	64 1/2	..	5 19 5
5,782,062	Metropolitan Consolidated	100	2 3/8 %	1 %	1 %	1 %	39 1/2 — 40 1/2	39 1/2 — 40	40 1/2	39 1/2	— 1/2	1 5 0
2,640,214	Do. Surplus Lands	100	2 3/8 %	2 3/8 %	2 3/8 %	2 3/8 %	68 — 70	68 — 70	69 1/8	68 1/2	..	3 18 7
8,285,000	Do. District	100	Nil	Nil	Nil	Nil	17 1/2 — 17 3/4	17 1/2 — 18	17 1/2	17 1/2	+ 1/2	Nil
891,397	Metropolitan Electric Trams., Ord.	1	..	..	..	4 1/2 %	3/8 — 1/2	3/8 — 1/2	..	..	..	..
314,016	Do. do. Defd.	1	Nil	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	5/16 — 3/8	5/16 — 3/8	..	..	..	5 19 5
595,600	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	96 — 98	95 — 97	96 1/2	..	—1/2	4 12 9
$10,823,200	Mexico Trams Co., Common Stock	..	..	..	..	..	150 —153	131 —134	133	127	+ 1	..
$9,000,000	Do. 1st Mort. 50-year 5% Gld. Bds.	..	..	..	..	5 %	92 — 94	91 1/2 — 93 1/2	94	92 1/2	— 1/2	5 6 11
245,500	Potteries Electric Traction	1	4 %	4 %	4 %	Nil	1/8 — 1/4	1/8 — 1/4	..	..	..	8 13 0
245,500	Do. 6 % Cum. Pref.	1	5 %	5 %	5 %	5 %	1/4 — 3/8	1/4 — 3/8	..	..	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	86 — 89	86 — 89	..	..	..	5 1 2
87,350	Telegraph Construction and Maintenance	12	15 %	15 %	17½%	15 %	33 — 34½	33 — 34½	..	..	..	5 19 0
140,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	99 —101 xd	101 —103	..	..	..	3 19 3
1,000,000	Underground Electric Railway, 5% Prior Lien	..	..	..	..	..	101 1/4 - 102 1/4	102 —103	102 3/8	101 3/8	+ 1/2	..
2,800,000	Do. do. 4½% Bonds	..	..	..	..	4½%	87 — 89	87 — 89	88 1/4	87 1/8	..	5 1 2
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	37 — 39	37 — 39	37 7/8	..	..	..
66,666	Willans & Robinson, 1 to 80,000 & 80,001 to 116,666	5	Nil	Nil	10 %	Nil	3/8 — 7/16	3/8 — 7/16	..	..	..	..
66,666	Do. 6 % C.P., 80,001 to 80,000 & 125,001 to 141,666	1	Nil	..	6 %	6 %	2 3/8 — 2 5/8	2 3/8 — 2 5/8	..	..	..	7 7 4
215,495	Do. % 1st Mort. Deb. Stock		4 %	4 %	4 %	4 %	76 — 78	76 — 80	..	..	..	5 0 0

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000		5½%	5½%	5½%	5½%	4½ — 4¾	4½ — 4¾	..	..	..	5 10 0
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	93 — 96	93 — 96	..	..	..	4 13 9
30,449	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10%	10 %	10 %	8 — 8¼	8 — 8¼	8⅛	8 1/16	..	5 17 8
9,551	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	8 — 8½	8 — 8½	..	..	..	4 2 4
886,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	97 —100	97 —100	..	..	..	3 18 5
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	5 %	3 7/8 — 4 1/8	3 7/8 — 4 1/8	84/4½	..	..	5 14 3
80,000	Do. do. dd. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4 1/8 — 4 3/8	4 1/8 — 4 3/8	95/-	92/6	..	4 12 4
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	4 1/8 — 4 3/8	4 1/8 — 4 3/8	..	..	..	4 12 4
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	96 — 99	96 — 99	97½	..	+ 1/8	5 5 11
49,490	Chelsea Electricity Supply, Ord.	5	6 %	4½%	4½%	4½%	3 7/8 — 4 1/8	3 7/8 — 4 1/8	78/9	..	..	3 19 3
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	5 9 1
70,596	City of London Elec. Lighting, Ord. 40,001—110,596	10	6 %	6 %	6 %	6 %	10 1/2 — 11	10 1/2 — 11	10 7/8	10 13/16	..	4 7 5
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	11 5/8 — 12 3/8	12 — 12 3/4	12 3/8	12 1/2	+ 1/8	5 9 1
400,000	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	120 —123	121 —124	122 1/2	122 3/4	+1	4 14 1
300,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	4 0 8
50,000	County of Durham Electrical Power, Ord.	5	4 %	4 %	2 %	..	2 3/8 — 2 5/8	2 3/8 — 2 5/8	..	..	..	4 8 3
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	5 %	3 1/8 — 3 3/8	3 1/8 — 3 3/8	..	..	..	3 6 8
250,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	..	..	5 %	93 1/2 — 95 1/2	93 1/2 — 95 1/2	..	..	..	6 13 4
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	5 %	8 1/8 — 8 3/8	8 1/8 — 8 3/8	..	..	..	5 4 9
55,000	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10 3/8 — 11 1/8	10 3/8 — 11 1/8	11	10 25/32	..	5 6 8
200,000	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	104 —107	103 —106	104½	103½	—1	4 4 11
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 7 5
80,000	Edmundson's Electric Corporation, Ord. Shares	5	4 %	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	3 %	Nil	Nil	3/8 — 5/8	3/8 — 5/8	..	..	..	Nil
430,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	60 — 63	60 — 63	..	..	..	7 2 10
$8,150,000	Electrical Dev. Co. of Ontario, 5% 1stMtg. Gold Bnds.	$500	..	..	..	5 %	85½ — 88½	85½ — 88½	87½	..	..	5 13 0
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	5½%	4½ — 5	4½ — 5	..	..	..	5 10 0
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	5 %	5 — 5½	5 — 5½	..	..	..	4 10 0
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	98 —101	98 —101	..	..	..	4 9 1
15,000	Hove, 1 to 15,000	5	9 %	9 %	8½%	8½%	7 7/8 — 7 3/8	7 1/2 — 7 3/8	..	..	..	5 11 6
$1,376,000	Kaministiquia Power Co., 5 % Gold Bnds.	..	..	..	..	5 %	97½ —100½	97½ —100½	98⅜	98½	..	4 19 6
21,000	Kensington and Knightsbridge Electric Ord.	5	10 %	10 %	10 %	8 %	6 3/4 — 7 3/8	6 5/8 — 7 3/8	7 3/8	7 1/16	..	5 8 6
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	97 — 100	97 — 100	98½	..	..	3 19 3
111,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	4 %	2½	3 %	1 7/8 — 2 1/8	1 7/8 — 2 1/8	..	..	..	4 16 0
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	5 3/8 — 5 5/8	5 3/8 — 5 5/8	..	..	..	5 11 8
£82,255	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4½%	4½%	4 %	92 — 96	93 — 97	94	..	+1	4 2 6
300,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	8 %	6½%	5 %	4 1/2 — 4 3/8	4 1/2 — 4 3/8	88/9	85/7½	..	5 8 1
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4 3/8 — 5	4 3/8 — 5	98/9	..	..	4 10 0
285,000	Do. 4½ % 1st Mort. Deben. Stock	..	4½%	4½%	4½%	4½%	105 —108	105 —108	107	..	..	4 3 4
248,000	Do. 5% Mort. Deben. Stock Redem.	Stock	5½%	5½%	5½%	5½%	83 1/2 — 86 1/2	83 1/2 — 86 1/2	..	..	..	4 0 11
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	..	5 %	5 %	5 %	5 %	82 3/8 — 84 xd	82 — 84	83½	82½	— 1/2	6 1 11
13,585	Do. Light and Power Co., Ltd., Common	$100	..	..	..	3½%	67 — 70	65 — 68	69⅛	65	—2	5 2 11
$4,400,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	..	7 %	106 —110	104 —108	109	105	—2	6 9 8
$12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.		..	..	..	5 %	82½ — 89½	88 — 89	89½	88½	+3	5 12 4
950,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	92 — 96 xd	92 — 96	..	..	..	4 13 9
180,491	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	2½%	2½%	4 3/8 — 5 1/8	4 3/8 — 5 1/8	..	..	..	2 7 8
134,000	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	5 %	4 1/2 — 5 1/8	4 1/2 — 5 1/8	..	..	..	4 15 8
126,500	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,265	100	..	..	..	..	99 —101	99 — 101	..	..	..	..
10,852	Notting Hill Electric Lighting	10	7½%	7½%	7½%	7 %	11 1/2 — 12 1/2	11 1/2 — 12 1/2	..	..	..	5 12 0
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	..	6 — 6 1/2	6 — 6 1/2	6 1/2	..	..	5 7 8
50,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	94 — 97	94 — 97	..	..	..	4 1 8
119,694	River Plate Electy. Co. Ord. Nos. 1 to 120,507	1	..	2½%	6 %	8 %	1 3/8 — 1 1/2	1 5/8 — 1 7/8	28/3	27/3	— 1/8	5 7 3
100,000	Do. do. 6% Non Cum. Pref. Nos. 1 to 100,000	1	6 %	6 %	6 %	6 %	1 1/32 — 1 3/32	1 3/32 — 1 5/32	20,6	..	— 1/8	5 10 4
200,000	Do. do. 6% Deb. Stk. Red.	100	5 %	5 %	5 %	5 %	102 —105	102 —105	..	..	..	5 8 1
40,000	St. James' and Pall Mall Electric Light, Ord.	5	12½%	10 %	10 %	10 %	8 3/4 — 9 1/4	8 3/4 — 9 1/4	9	..	..	6 13 4
80,000	Do. do. 7 % Pref. 20,081 to 40,080	5	7 %	7 %	7 %	7 %	7 — 7 3/8	7 — 7 3/8	..	..	..	4 13 4
159,000	Do. do. 5½ % Deb. Stock Red.	100	5 %	5½%	5½%	5½%	84 — 88	84 — 88	..	..	..	3 19 7
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
65,000	South London Electric Supply, Ord.	4	4 %	5 %	4 %	5 %	2 3/8 — 2 5/8	2 3/8 — 2 5/8	60/-	57/6	..	6 9 0
125,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	2½%	2½%	1/8 — 1/16	1/8 — 1/16	..	..	..	4 8 11
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1 1/8 — 1 1/16	1 1/8 — 1 1/16	..	..	..	5 6 8
224,520	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	100 —103	100 —103	..	..	..	4 0 0
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	5 %	1 — 1 1/8	1 — 1 1/8	..	..	..	25 0 0
50,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	2 — 2 1/8	2 — 2 1/8	37/6	..	..	11 2 2
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	80 — 84	80 — 84	..	..	..	5 7 2
£68,000	Victoria Falls Power Co., Pref. Nos. 1 to 800,000	1	..	..	..	5 %	2 3/8 — 2 5/8	2 3/8 — 2 5/8	16/9	..	..	5 19 5
110,000	Westminster Electric Supply, Ord.	5	13 %	12 %	10 %	10 %	8 1/2 — 9 1/2	8 1/2 — 9 1/2	9 1/16	9 1/16	..	5 8 1
81,279	Do. do. 4½ % Cum. Pref. Reduced from 5% since 31st Dec., 1905)	5	5 %	4½%	4½%	4½%	5 — 5 1/8	5 — 5 1/8	5 1/16	..	..	4 3 9

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. Interim Dividend.

Bank rate of Discount 2½ per cent., April 1st, 1909.

THE L.C.C. AND THE PURCHASE OF STORES.

[COMMUNICATED.]

THE report of the General Purposes Committee (No. 2), dated June 14th, contains matter of considerable interest to municipal officials whose duties include the purchase of material. The extent of the operations of the Council is shown by the fact that the purchase and distribution of general stores, stationery and school material employs a staff of 350 persons, in addition to which the Highways, Architects, Fire and Tramways Departments possess their own depôts and buying organisations. An attempt to secure increased efficiency and economy by consolidating this work of the stores staffs under a common purchasing department is not unnaturally attractive to the business men who form so large a proportion of the Council, and a scheme for effecting this is outlined in the report above referred to.

The principle of centralised working is too generally accepted in modern business to call for discussion, but it may not be amiss to direct attention to the limitations of its usefulness which may well arise in a system where the material in use is so diverse in character, and so largely consisting of highly specialised products.

The purchasing department is an essential part of the organisation of many large manufacturing businesses to-day, but, since particular attention was directed to this and other features of factory systems a few years ago by certain specialists in business methods, its useful range has been found to be much more limited than was anticipated. Unless administered with the greatest care, such a department may only multiply paper work and delays, and bring discouragement to those actually responsible for production, by interposing a more or less inflexible barrier between the designer and maker and those who supply him with his raw material, much of which may be far from raw, and already the product of skilled labour and special processes with which the buyer must be closely in touch if the best and most economical results are to be obtained.

Although the report appears to have been drafted with a careful regard to the special requirements of the engineering departments of the Council, which suggests that strong representations have been made on the subject by those departments, yet in practice, possibly, the tendency would be to extend the scope of the central stores and treat as common many items of material which the superintendents would prefer to select more particularly with regard to their own use and purpose.

Amongst the general controlling and administrative duties of the officer proposed to be appointed in charge of the department appear the following :—

"To ascertain from the heads of departments the extent and nature of their requirements, and to obtain and supply the necessary stores, and to advise the heads of departments in cases in which economy can be effected.

"To keep the standard patterns and examine quality of deliveries, except in case of special goods, which the consuming department shall examine and report upon.

"To advise the Stores Committee upon the acceptance of tenders, investigate complaints against contractors, &c."

In working under these particular orders, the stores superintendent would be called upon to exercise exceptional discretion in order to avoid actually hindering and reducing the working efficiency of his consumers, and yet keep his operations from degenerating into a mere repetition of paper work. In the first instance, the head of a technical department can hardly produce the best results unless he is a competent buyer of stores with regard to quality and price, and well up to date in the productions and charges of those suppliers who cater particularly for the needs of his department.

To check deliveries for quality with the necessary promptness would involve the employment of expert examiners who, possibly, would not be always fully occupied, and certainly must to some extent be subject to the heads of the consuming departments if inefficiency and friction are to be avoided.

The placing of tenders, it may be feared, would, under the rather impersonal advice of the general storekeeper, be more and more decided on price rather than the real economic suitability of the goods for the purpose in view, and complaints against contractors are not likely to be diminished or adjusted more easily by putting a barrier between the user and supplier.

It would be of some assistance in the consideration of the scheme if estimates were available showing (*a*) the proportions of the annual purchases of the Council which are represented by stores common to all or several departments, and special goods, the buying of which cannot properly be taken out of the hands of the consuming department.

(*b*) The estimated cost of the new scheme over and above the present buying expences of the Council.

(*c*) The percentage which such increased cost represents on average yearly purchase totals—an amount which has to be balanced against the economies to be effected by the new scheme.

Amongst objections to present method, it is claimed that contractors would offer better prices in some cases but for the fact that the goods supplied, although in large quantities yearly, have to be made up in comparatively small parcels and delivered to many depôts. This complaint will only really disappear if the central stores succeeds in opening bulk deliveries, dividing, repacking and distributing more cheaply than each contractor is willing to make up and deliver the small parcels—a proposition possibly presenting some difficulties under the methods of working in vogue with this model employer.

ACCIDENTAL EXPLOSIONS AT GAS PRODUCER INSTALLATIONS.

ALTHOUGH it is quite true that, with a reasonable amount of care on the part of the attendant, explosions of producer gas of any serious extent can be avoided, experience shows that at times these accidentally occur, with results of damaged apparatus, and sometimes of a nature dangerous to life. It is worth while, therefore, to consider the possibilities in this connection, as well as the means to be employed to prevent their occurrence.

In the case of mixtures of pure combustible gases with air, as low a proportion of hydrogen as 4½ per cent. is capable of ignition ; while, on the other hand, hydrogen with 43½ per cent. of air is also liable to ignition, but in either case the pressure developed would be very slight.

Carbon monoxide in the proportion of 7½ per cent. can ignite if the temperature is about 1,000° F., or 9½ per cent. if at 750° F., but if at atmospheric temperature, ignition will only take place when 16 per cent. of CO is present. When the proportion of CO is in excess, ignition may take place with 42 per cent. of air. As both these gases are present in considerable proportions in producer gas, it is evident that explosive mixtures, through leakage, cover a large range.

Other combustible gases have ranges of ignition less than those stated, so that they need not be considered. When the mixture of combustible gas and air, at atmospheric pressure, approaches the proportions for perfect combustion, ignition may cause a rise of pressure up to about 80 lb. per sq. in.

To provide against damage from accidental explosions in apparatus employed in the generation and purification of power gas, one of the following conditions may be adopted :—(1) All the vessels may be designed to resist a pressure of 80 lb. per sq. in., with the usual factor of safety ; or (2) vessels of less working strength can be provided with water seals, to act as safety valves. While slight explosions occuring in coke scrubbers provided with seals only result in the ejection of a little water, explosions through gas passing through the gas engine and exploding in the exhaust or air silencers might result in damage, if these are not designed of sufficient strength to resist the pressure developed.

Although water seals and pipes leading from silencing chambers to the atmosphere act as safety valves in the

manner referred to, it must not be overlooked that they are only effective when of sufficient capacity in proportion to the volume of space in which the explosion occurs, as otherwise, owing to the rapidity of the increase of pressure due to the explosion, with small pipes, the necessary relief is not available. In designing gas generating and purifying plant, precautions should be taken to prevent, as far as possible, any leakage of gas into air, or air into gas, and one of these is the provision of faced joints for all pipes fitted with flanges, for even a very slight leak, such as might occur from a cracked flange or small test cock, will admit a considerable volume of air if the difference of pressure between the internal and external surfaces only amounts to a few inches of water gauge pressure.

As the amount of leakage depends upon the difference in pressure on either side of the aperture, especial precautions should be taken to keep the internal and external pressures as nearly similar as possible.

In "pressure" gas plants any leakage is outwardly, as long as the entire system is free from a higher pressure than that of the gas; the air supply to provide for overcoming friction, &c., in passing through the fire, is maintained at a higher pressure than the gas, so that in any saturation or regenerative system, where the air and gas are brought near together, separated only by tubes or sheet-metal shells, any leakage in this part of the system would be inwardly, *i.e.*, air into gas.

In suction plant all leakage is inward, owing to the reduction of pressure in the whole system, at each charging stroke of the engine, and even a small cock left open by accident may admit a considerable volume of air.

Quite recently, as recorded in the June issue of *Vulcan*, there was an accidental explosion at a pressure-gas plant in the district of Manchester, due to air leakage through the corrosion of tubes through which the gas passed. The plant was for providing gas for driving engines of 320 H.P., and consisted of a gas producer, saturator, coke scrubber, sawdust filter, tar extractor, air-blast fan and a gas-holder.

The plant had been off for repairs, and at re-starting the usual precautions were taken to ensure that any residual gas and air in the apparatus was duly removed, by blowing out the contents a number of times. However, the gas delivered by the gas-holder was found to be of too poor a quality to start the engines; further attempts were made, and the contents of the gas-holder were renewed, and while the attendant was preparing to test the gas again with a torch, an explosion occurred in the gas-holder, doing such damage as to put the installation out of work for several days. It was found on examination that the trouble was caused by the deterioration of the tubes of the saturator during the three years the plant had been at work.

The saturator consisted of a cylindrical vertical vessel provided with tube plates near the ends, connected by 4-in. diameter tubes; water surrounded the tubes, through which the hot gas ascended. The supply was constant and the depth regulated by an overflow, so that the vessel was only partly filled; the cooling of the gas heated the water, and the air-blast was led through the upper part of the chamber, becoming charged with vapour on its passage. One of the tubes was so corroded as to be separated into two parts, while the other six could be pierced by a pointed tool.

The interior of the tubes was subjected to the mechanical action of a cleaning bar for the removal of tar and to prevent accumulations from obstructing the tubes.

As the air-blast surrounding the tubes at the upper portion was at about 2 in. water-gauge pressure higher than the gas passing through the interior, air leaked into the gas, and thus filled the holder with a more or less explosive mixture. The conditions of warm water, steam and air are conducive to corrosion of wrought-metal tubes, so that any apparatus of the type mentioned should have special facilities for the examination and cleaning of all surfaces liable to be attacked by rusting, as well as the renewal of any part found deteriorated.

We may quote an instance where a feed-water heater fitted with copper pipes was applied as a cooler for a gas plant, and in which it was found that, after a comparatively short run, the pipes had become eaten away in places by corrosion from contact with the gases; but in this case, as there was pressure in the pipes, the leakage did no damage.

Another instance of the danger from leakage of air into gas pipes may be quoted, in the case of a blast-furnace gas-cleaning plant.

The gas was drawn from the underground flue through a washer and condenser by the suction of a fan, and then passed on through sawdust filters to a gas-holder to supply a large engine.

A small gas engine, driven by the same gas supply, was situated at a considerable distance from the gas-holder. A leakage occurred at a joint in the pipes on the suction side of the fan, and air entered the system along with gas. Both the engines were at work, but when the mixture of gas and air reached them there was an explosion right through the gas apparatus.

Owing to the low heating power of the gas when not compressed, the effects of the explosion were only slight; the gas-holder bell was lifted about a foot or so, and the sawdust filter covers were blown off.

In suction-gas plants, besides the possibilities already referred to, there are possible dangers from the wrongful manipulation of the valves and test cocks; to reduce these as far as possible, one method is to have as few of these valves and test cocks as can be made effective, while three-way valves should be so designed that they cannot inadvertently be turned so as to connect vessels in a manner not intended, or in such a way as to connect all the three passages at once through the valve not being moved to the required extent.

POWER SUPPLY TO BREWERIES.

By E. P. A.

It has been said that an electrical engineer must possess a knowledge of everyone's business, together with a smattering of electrical lore; and in dealing with the requirements of power consumers, the station engineer fully appreciates the appositeness of the statement.

The requirements of breweries are such that a number of interesting points arise bearing on the means of electrically driving brewery plant and installing the necessary control gear, &c., and it is the writer's intention to endeavour to deal with the more interesting problems that he has met with in connection with the supply of power to breweries of moderate size.

The processes of brewing necessitate a certain amount of steam-raising plant, and a steam-driven brewery follows in natural sequence, unless it can be proved to the owners that advantages are gained by using another source of power. It is not difficult to convince a prospective consumer that electric motors offer the best means of driving his various apparatus, principally on account of the number of isolated pieces of machinery in use and the distances between the seats of operation. With any form of main driving, abnormally long shafts are required, with the usual accompaniment of clutches, loose pulleys, belts and suchlike power wasters; and, in addition, certain small machines, such as portable pumps, hoists of various kinds, and grain-handling gear, have to be hand-operated.

Illustrations of an instance where an antiquated beam-engine has been displaced by a 10-H.P. motor are shown in figs. 1 and 2. The beam engine is geared to a vertical shaft of ample proportions, which passes through two floors of the building, in order to drive a grain mill and hoist. Fig. 2 shows the 10-H.P. motor used to do the same work, and fixed near to the mill. Counter-shafting and belting are used in this case in order to adapt the old driving pulley and hoist gear to the modern method of driving, so that the increase in efficiency is not so marked in this instance as it is in cases where the mill, &c., are made for electrical driving.

The hoist is driven off the main shaft of the mill, and is put into operation by a cone friction clutch.

It was found necessary to reduce the speed when lifting heavy sacks, such as sugar, in order to suit the capacity of the clutch, and a resistance with a short-circuiting switch was introduced into the armature circuit. This method, although wasteful, has the advantage of varying the speed

of the motor in accordance with the load on the hoist, owing to the drop across the resistance, and thus keeping within the power-transmitting capacity of the friction clutch.

A feature of brewery work is the variety of uses to which electric motors can be adapted. A tabulated list of some of the machines in use in a brewery in actual operation is given below, to show in a convenient manner the class of work to be done and the type of motor used in each case.

All the apparatus installed is specially adapted for motor driving, and consequently the motors and gearing are arranged to run at the most economical speeds, necessitating in most cases only single-reduction gears. Refrigerating apparatus is direct-coupled to a low-speed motor, which arrangement gives a great economy of space, although the first cost of the motor is somewhat high for the rating. In the bottling department the machines used require such a small amount of power to drive them that it is found convenient to use only one small motor, driving on to countershafting. A 3-H.P. motor will drive four bottling machines and four bottle-washing machines, and find employment for about 15 hands tending the machines.

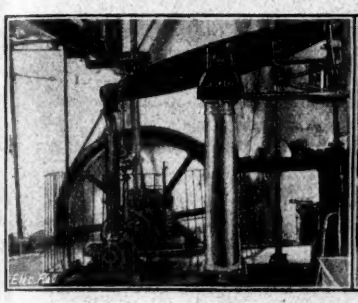


FIG. 1.

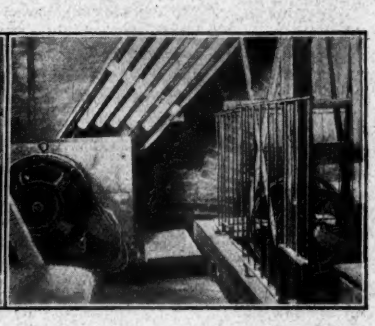


FIG. 2.

It is sometimes necessary to use a reversible motor on the grain conveyor. Single-reduction worm gear is most suitable in this case, and the reversing operations are best carried out at the starter, although mechanical devices are sometimes used for this purpose when the apparatus is in an easily accessible position.

TABLE OF MOTORS.

Type.	Machine driven.	Remarks.
10-H.P. totally enclosed	Mill	Belt drive.
5-H.P. enclosed	Hoists	Mechanical reversing gear.
10-H.P. enclosed	Barrel hoists	These machines in damp situation where liquor is barrelled.
10-H.P. enclosed	Grain conveyor	Single reduction, worm gear. Reversible starting gear. Subject to steam from hot grain.
5 H.P. enclosed	Pump	Artesian well pump.
3-H.P. enclosed	Centrifugal pump	Single-reduction gear.
¼-H.P. protected	Portable pumps	Circulating liquor in fermenting vats.
10 H.P. enclosed	Mash tun	—
15-H.P. protected	ditto. rakes	Double-reduction gear, enclosed motor not necessary.
9-H.P. protected	Refrigerator	Low speed (200 R.P.M.), direct coupled, mounted on same bed as compressor.

All the motors used in a brewery should be of the totally enclosed type, to guard against steam and dust. The atmosphere is heavily laden with vapour from the hot liquor and from the liberal use of hot water for scouring purposes, resulting in a considerable amount of condensation on the walls and machinery, which will sometimes lower the insulation resistance of the motor to a dangerous degree.

Trouble from this source can be avoided by using a non-hygroscopic insulating material on the brush gear, as that is the part most affected by the damp. Also the insulating bushes, distance pieces, &c., used between the live parts and the brush-racker, should be arranged so as to give a long leakage path.

The motors installed in damp situations should be raised from the floor about 1 ft., and, where possible, housed in a brick compartment properly ventilated. If brick is not suitable, then a substantial wooden structure can be used to cover the motor. A good method of securing the efficient ventilation of a motor covering, whether of wood or of brick, is to burn a single 16-C.P. lamp at the bottom, and provide an air inlet and outlet. The heat from the lamp is sufficient to keep the air in circulation, and the improvement in the condition of a motor under these conditions is most marked.

In situations where abnormal damp is not in evidence, fine dust will probably have to be guarded against. This is particularly the case in the mill room, especially if the mill is an old-fashioned one, with no efficient means of carrying off the dust. The motor is best protected by enclosing it in a tin-lined wooden house, particular care being taken to see that the pulley side is well protected. A totally-enclosed motor should still be used, as the dust is inflammable to a certain extent, and should therefore be kept clear of the brushes or any other gear where sparking may take place.

The starters and other control gear are worthy of particular attention, and should be of ample design and proof against the ill effects of moisture. Starters of the grid type, with the usual accessories, have been found very satisfactory, providing that all the insulating material is of non-hygroscopic material. It is good practice to enclose the whole of the control gear of each motor in a fireproof glazed case, and to provide each motor with a separate switch fixed in a convenient position for the operators of the machine to use for stopping the motor if necessary. The machines are often under the control of unskilled persons, and therefore liable to much abuse when starting. To prevent trouble arising from this source, the starters should be of such a type that the rate of acceleration is out of the control of the operator. Elaborate automatic devices are not to be recommended for such work, but a simple worm-geared starter will answer the purpose well, if of sound mechanical construction.

In view of the fact that condensation is a serious consideration, it is evident that a perfectly watertight system of installing the necessary cables and wires is essential; also an electrically continuous metallic covering is necessary to prevent danger of shock. The only two systems that are suitable are lead-covered cables, and rubber-insulated cables run in screwed barrel, and the writer's experience in this direction leads him to favour the use of paper-insulated, lead-covered cables. They should be fixed by means of porcelain cleats or insulators, and kept quite clear of all brickwork or ironwork about the building, in order to prevent the accumulation of moisture between the lead and the building, which will otherwise cause rapid deterioration of the lead and the fastenings. The principal advantage of using this class of cable is the absence of space between the conductors and the metallic covering, thus preventing trouble from condensation around the insulating material. In the mill room and grain stores, steel conduit wiring should be used, to protect the cables from vermin, as lead covering is useless for this purpose.

Particular care should be bestowed on all junctions with fittings, control gear and motors, and any precautions taken to make all such points mechanically and electrically sound will amply repay any reasonable additional expense incurred. If paper-insulated cables are used, suitable sealing-end connections are necessary to make a lasting job, and rubber tails can be conveniently used to connect up to motors and starters, as these will be inside the protective cases and coverings. The writer has found that, in such situations as are dealt with here, a satisfactory way of connecting-up to motors is to dispense with terminal boards, and bring rubber leads through a suitably bushed hole in the motor frame and join them by means of screwed connectors to the supply

cables, suitably insulating the joints thus formed. This method makes a safe job, and helps to keep up the insulation resistance, and also reduces the number of live terminals to a minimum.

The efficient earthing of motor frames, starters, cable coverings, &c., is of the utmost importance in breweries. The floors are usually wet, and the workmen often wear iron-shod clogs on that account, so that a shock under such conditions is attended with considerable danger.

Although it is an expensive method, the writer recommends the installation of a complete earthing system, to which all motor frames, starter cases, switch covers and metallic cable sheathing should be connected. To merely bond a motor frame on to the lead covering of a cable is inviting damage to the cable if the motor sparks over to frame or the insulation breaks down, besides introducing an element of danger of shock. Instances of the lead covering of cables being melted away at the point of contact of an earth wire, and thus leaving the faulty apparatus "alive" to shock any unwary persons, are not uncommon. The earthing system, in its turn, should be connected at several points to a water-supply pipe that always contains water, and contact with any apparatus used for heating or in conjunction with the covers should be avoided.

A brewery load is a desirable one to obtain, as a power load factor of about 20 per cent. may be expected, and a load factor on the combined lighting and power load of 16 per cent. The peak will coincide with the station peak, but a small all-night load will be experienced.

Brewery owners usually require some assurance as to the continuity of supply, as in the case of main breakdowns a valuable brew may be damaged if the process is discontinued for any length of time. Under such conditions provision for supplying energy by more than one route is generally sufficient to satisfy the brewer's requirements.

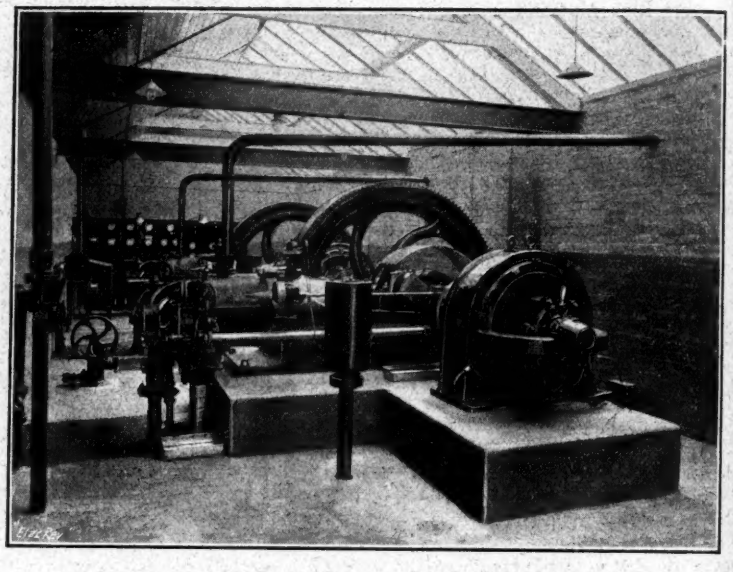
The rates for charging for energy must depend on the local conditions, and as much has recently been written on this subject, it is unnecessary to go into the matter here.

ELECTRIC LIGHTING AT PENRITH.

Some years ago the Penrith Urban District Council obtained powers for electric lighting in the town, and had proceeded so far as to let tenders provisionally for the carrying-out of the work, when the L.G.B. stepped in and refused to sanction the necessary loan, chiefly owing to the fact that the Council had also in hand at the time sewerage and water schemes involving a considerable expenditure.

However, the desire for the electric light remained, and ultimately the provisional order was handed over to a syndicate which, under the style of the Penrith Electric Supply Co., Ltd., has installed the necessary plant and mains for supplying electricity.

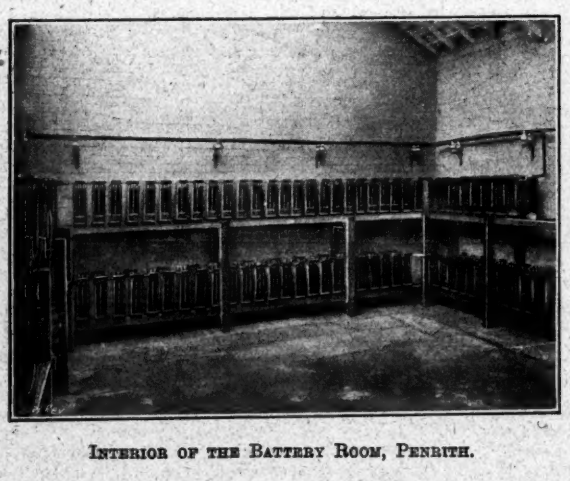
The plant consists of two 65-B.H.P. Crossley gas engines, running at 200 R.P.M., and direct coupled in each case to a 40-KW. compound-wound 220-volt generator. The engines are of the suction type, and two producer plants are installed in an adjoining room, so arranged that either engine can be worked from each producer.



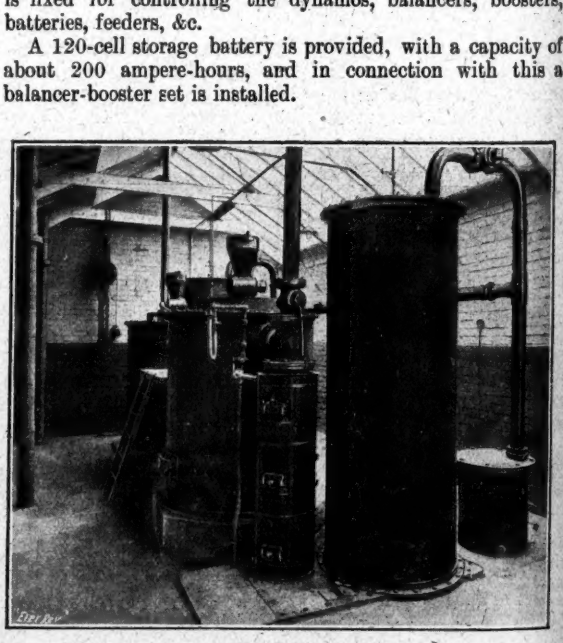
Generating Plant, Penrith Electric Supply Co.

At one end of the engine room the necessary switchboard is fixed for controlling the dynamos, balancers, boosters, batteries, feeders, &c.

A 120-cell storage battery is provided, with a capacity of about 200 ampere-hours, and in connection with this a balancer-booster set is installed.



Interior of the Battery Room, Penrith.



Crossley Producer Plant, Penrith.

The feeder and distributing mains are of the three-core type, lead-covered and armoured, and laid direct in the ground; feeder pillars are provided containing bus-bars and plug fuses for three feeding mains and five distributors.

The three-wire system of supply has been adopted, with 220 volts across the outers; this pressure was decided on, in the first instance, in order to facilitate the use of metallic-filament lamps of low candle-power in parallel. Throughout

the whole of the plant has been designed so as readily to double the pressure if found to be advantageous.

Already some 40 consumers are connected to the mains, representing approximately 800 25-c.p. lamps for lighting, and the motive power installed, and applications received, are equivalent to 60 h.p., a matter which augurs well for the ultimate success of the undertaking.

The price charged for lighting purposes is 5d. per unit, and for power, heating and cooking purposes 2½d. per unit.

The generating station is situated almost in the very centre of the area of supply, and the buildings were erected by Messrs. Richardson & Co., of Penrith; the contract for the whole of the generating plant was let to, and carried out by, Messrs. W. P. Theermann & Co., of Manchester; Messrs. Henley's supplied and laid all the mains, feeding pillars, and distribution appliances.

The works were designed by, and have been erected under the supervision of, Mr. J. W. Speight, M.I.E.E., of St. Anne's-on-the-Sea, who previously acted as consulting engineer to the Penrith Council.

BOARD OF TRADE REGULATIONS.

Electric Lighting Acts, 1882 and 1888.

With reference to the Regulations made by the Board of Trade under the above-named Acts for securing the safety of the public, and for ensuring a proper and sufficient supply of electrical energy, we are officially informed that Regulations having recently been made by the Home Office for the generation, transformation, distribution, and use of electrical energy in premises under the Factory and Workshop Acts, 1901 and 1907, the Board have found it necessary to amend their Regulations so as to avoid overlapping between the Regulations of the two departments. The Board of Trade have accordingly made new Regulations which from July 1st, 1909, except as to so much of any electrical station as was constructed before July 1st, 1908, take the place of the Regulations previously made by the Board, and will, after January 1st, 1910, entirely supersede the last-mentioned Regulations.

The forms differ from one another as regards Regulations for ensuring a proper and sufficient supply of energy in order to meet the different cases where the undertakers are:—

1. A local authority in the provinces (index letters on right-hand corner of form 1 L.A. (P.)).
2. A company in the provinces or in the City of London (index letters 2 C. (P.)).
3. A company in London except as to the City (index letters 3 C. (L.)).
4. A local authority in London (index letters 4 L.A. (L.)).

The differences between the four sets of Regulations are found only, we believe, in those defining the relations between the undertakers and the local authority, the Board of Trade, and the London County Council respectively, as regards any alteration in the declared pressure or frequency of supply.

The alterations in the Regulations as a whole consist mainly in the addition of a rider to the effect that the Regulation shall not apply within the premises of a factory, a workshop, a mine, or a quarry (where the apparatus is under the jurisdiction of the Home Office) to each of the Clauses Nos. 1, 2, 9 and 10.

Copper.—The extraordinary figures for visible supplies of this metal continue to be maintained, as shown by Messrs. Merton's circulars for the month of June. The mid-monthly return was 62,261 tons, and that for the end of the month 67,379 tons. In the face of such figures as these, it does not seem probable that any attempt to enhance the price can be maintained at present. The visible supplies for June 30th are principally composed of bars, ingots and standard copper at Liverpool and Swansea, totalling to 41,020 tons. Of the supply figures, those for North America to Liverpool, Swansea and Havre are above normal, implying that stocks are no longer being held at the mines. Other shipments are about the average.

THE CONTINENTAL ELECTRICAL ENGINEERING INDUSTRY.

Further Financial Results Showing Reduced Dividends.

The unfavourable effects of the decline in the condition of trade in general continue to be reflected in the working results of German manufacturing companies for the past year, although the worst of the depression in the light electrical engineering departments, at all events, is reported, correctly or incorrectly, to have now been overcome. So far, no opportunity has presented itself for bringing into play the powerful financial resources which are to be utilised by the electrical banks which were formed a short time ago, and from the prevailing conditions of the national finances and the uncertainty regarding legislative schemes for the imposition of additional taxes, there seems little hope of any speedy development of electrical enterprise that could afford profitable activity for the banks.

The recent issues of capital in Europe only include one German emission, namely, a 4½ per cent. loan of £150,000 offered by the Birnbaum-Meseritz-Schwerin overland central station. In Switzerland subscriptions have been invited for a 4½ per cent. loan of £280,000 by the Wangen Electricity Works on the Aare; £280,000 in a 4½ per cent. loan by the Watt Co. for electrical enterprises of Glarus; and for £240,000 forming a 4½ per cent. loan of Escher, Wyss & Co., of Zurich, a large proportion of which was intended for the repayment of former loans.

German Works.

The general meeting of the Felten & Guilleaume-Lahmeyer Werke, of Mulheim-on-Rhine, recently approved the report and accounts for 1908. The unfavourable effects on industrial activity in all countries, according to the directors' report, affected the several departments variously, there being, on the one hand, a diminution in the quantity of work, and on the other less satisfactory results owing to the condition of sale prices. In the home market business was influenced by the uncertain political circumstances, the disquiet produced by taxation schemes, and the many social-political legislative proposals; trade became worse as the end of the year was approached, and the fall in prices was specially perceptible in the case of machines and apparatus and in regard to installations. The principal items in the accounts for the past two years are represented below:—

	1908.	1907.
Share capital	£2,750,000	£2,750,000
Bond capital	1,250,000	1,000,000
Gross profits on manufacturing, investments, &c....	730,940	772,200
General expenses ...	291,670	287,580
Depreciation provision	115,240	121,300
Net profits	278,130	329,780
Dividend...	220,000	264,250
Dividend, per cent. ...	8	10

The deliveries of machines by the dynamo works comprised 10,200 of a total of 500,000 h.p., as compared with 9,330 and 358,000 h.p. respectively, in 1907. The construction of electricity meters developed quite satisfactorily, and the production of measuring instruments was embarked upon by the acquisition of a factory already in existence, whilst the manufacture of arc lamps and switchboard apparatus was also added in the newly-erected apparatus factory. In addition, the output of metallic-filament lamps was started in the Berlin department, and was in course of favourable development. As to the question of the working of main lines of railway by electricity, the directors believed that this particular field would result in important orders in the future. The number of officials and workmen employed at the end of 1908 was 11,357, as contrasted with 11,760 at the close of 1907, 5,319 of the former being occupied at the dynamo works and most of the remainder at the Carlswerk. The orders possessed by the latter at the beginning of 1909 were approximately the same as the corresponding period in 1908, this being partly due to the maintenance of the wire business at the end of the year. The wire works in May were abundantly supplied with orders, which again permitted of full-time working, and prices were higher; the same remark was applicable in regard to the activity of the cable factory, although prices in respect of new orders were unsatisfactory. The degree of employment at the dynamo works was also satisfactory in general, though the prices obtained left much to be desired.

The principal activity of the Elektrizitäts Gesellschaft vorm. W. Lahmeyer & Co., of Frankfort, during 1908 9, was limited, as in the preceding year, mainly to the development of the electricity works and tramways owned or managed by the company. Although the unfavourable course of business in general exercised a hampering influence upon the progress and results of these undertakings, most of them yielded improved returns, whilst the slight decline in the gross profits was chiefly due to the reduction in the dividend paid by the Felten & Guilleaume-Lahmeyer Works, in which the company holds fully paid shares to the extent of £800,000. The accounts show net profits of £75,310, as compared with £80,070 in 1907-8, and it is proposed to pay a dividend at the rate of 6 per cent. as against 7 per cent. in the previous year, the share capital participating being £1,000,000 for the year and £250,000 for one quarter of the year.

The Akkumulatorenfabrik Gesellschaft, of Berlin-Hagen, was more largely employed in 1908 than in the previous year. Notwithstanding the reduction in prices in the first quarter in accord-

ance with the fall in the cost of raw materials, the directors state in their report that the value of the turnover advanced from £956,500 in 1907, to £961,500 last year. The English Tudor Co. did not pay any dividend for 1907, although one was in prospect for the past year. The accounts show the following figures:—

	1908.	1907.
Share capital	£400,000	£400,000
Gross receipts	318,690	330,620
Depreciation provision ...	19,500	37,900
Net profits	75,360	59,450
Dividend, per cent.	12½	12½

The report also refrains, as in 1907, from giving any details respecting the subsidiary companies in which the company is interested, the balance-sheet indicating an advance in the account for syndicate participations and securities of from £322,000 in 1907, to £342,500 in 1908. The reserve fund remains unchanged at £80,000, whilst the premium reserve fund for maintenance of consumers' batteries has been increased by £16,000 to £169,500. At the recent general meeting the chairman mentioned that business in the current year seemed to be more active, and the orders coming to hand were quite satisfactory.

The Mix & Genest Telephone and Telegraph Works Co., of Berlin, which was first formed in 1889, and has paid dividends almost averaging 9 per cent., is unable to make any distribution for 1908. According to the directors' report, the unfavourable results were partly due to the extraordinarily severe competition caused by the constantly growing circle of inland contractors. The price convention concluded in 1906 between the most important firms in the light electrical engineering branch only existed nominally during the past year, and it has since been discontinued. In England and Russia the competition of inferior manufactures manifested itself, whilst the depression in the general situation of business severely affected the London branches of German firms. In addition to these conditions, the cause of the diminished results was also to be found in special occurrences. Several extensive undertakings of the company abroad in part yielded no profits, and in part led to losses which rendered necessary the provision of special reserves. But, above all, the reduced profits were the result of an increase in the cost of production and management as brought about by the large new works at Schoneberg, Berlin. The accounts show the appended figures:—

	1908.	1907.
Share capital...	£350,000	£250,000
Bond capital	150,000	150,000
Surplus on working	65,090	69,900
Reserve provision for participations	6,250	Nil.
Depreciation provision	17,210	12,800
Net surplus	6,560	33,090
Dividend, per cent.	Nil.	9

During the year the company opened engineering offices at Munich, Dresden, Halle and Hanover, and one at Buda-Pesth for the Hungarian trade. The directors state that satisfactory results may be expected in the future on an improvement taking place in the general situation of business.

The report of the Akkumulatoren und Elektrizitätswerke (vorm. W. A. Boese & Co.), of Berlin, records a diminution in the turnover in 1908. The net profits amounted to £12,630, as contrasted with £11,300 in 1907, when no dividend was paid on the share capital of £225,000, and the proposal to distribute £1 4s. per share on the preference shares was withdrawn and still forms the subject of legal dispute between the company and one of the holders. It has been decided not to make any distribution on either classes of shares for 1908, but to apply the available surplus to the strengthening of the working capital and as a reserve for contingencies in respect of the unpaid preference dividend in 1907. The company is still interested in 13 central stations arising from its former financial activity, and some of these yield profits, whilst others require payments in fulfilment of guarantees.

VARIOUS FINANCIAL RESULTS.

	Share capital.	1908 dividend.	1907 dividend.
Kabelwerke Wilhelminenhof, Berlin	£50,000	12%	15%
Land und Seekabelwerke, Cologne...	262,500	8%	8%
Deutsche Kabelwerke, Berlin ...	—	6%	6%
Norddeutsche Seekabelwerke, Nordenham (distribution paid out of dividend and redemption funds)	300,000	4%	Nil
C. Lorenz Gesellschaft, Berlin ...	—	16%	12%
Elektra Gesellschaft, Dresden ...	—	4%	3½%
Westinghouse Electricitäts Gesellschaft	15,000	Nil	Nil
Gesellschaft fur Elektrotechnische Unternehmungen, Munich ...	—	Nil	Nil
Schlesische Akkumulatoren Werke, Breslau	—	Nil	Nil

FRENCH AND OTHER WORKS.

The Société Anonyme Westinghouse, of Paris, which has an ordinary and preference capital of £600,000 and bond capital of £300,000, realised gross profits amounting to £67,400 in 1908, as compared with £29,200 in 1907. After deducting administrative expenses and interest on bonds, the balance, including amount brought forward, reached £35,400, which has allowed of the payment of 5 per cent. on the preference capital of £200,000, and the allocation of £21,200 to the purpose of depreciation. The company is interested in the Italian Westinghouse Co., the Société Westinghouse-Leblanc, the Hungarian Automobile Co. and the Compagnie Internationale des Systemes Heintz.

The Ateliers de Constructions Electriques du Nord et de l'Est, of Paris, whose works are situated at Jeumont, realised net profits of £61,500 in 1908, as against £45,800 in the preceding year. As the latter sum was brought forward, the available balance amounted to £107,300, of which £46,000 has been placed to renewals fund and £20,000 provided for depreciation. The balance has permitted of the payment of a dividend of 10s. per share on the bearer shares and 3s. 8d. per share on the profit shares. In addition to extensive workshops, the Jeumont establishment comprises an iron and bronze foundry, a cable factory and a central station for general supply of light and power from two turbo-generators, each of 5,000 H.P., whilst a third unit of 10,000 H.P. is being installed to meet further contracts concluded for 8,000 H.P.

The Ateliers de Constructions Electriques de Charleroi are stated in the directors' report for 1908 to have received orders of the value of £328,000, as compared with £345,000 in 1907, and £276,000 in 1906. The diminution was more apparent than real, as the quantity of manufactures sold was greater than in the preceding year, but the heavy decline in raw materials reduced the cost and sale prices. It was possible to fully complete the programme of equipping the Marcinelle works with plant of the most modern type, and this had enabled the efficiency of the workmen to be increased and the prime costs to be reduced. A further development took place in the electrical equipment of collieries, and a motor transport service had been organised for the rapid delivery of material and motors to customers in the Hainault. Apart from electrically-operated centrifugal pumps and cranes for quarries and the usual orders from native and foreign tramways, the company supplied to the Belgian State Railways the first electric locomotive for use on these lines, the equipment comprising four motors of 250 H.P. Numerous orders were received for alternators of from 1,500 KW. to 4,000 KW. for use with steam turbines, and several three-phase motors for iron works and rolling mills were also delivered. New works were in course of erection with a connection with the State railways, and it was proposed to transfer to them certain branches for the development of which the Marcinelle works no longer sufficed. The accounts show net profits of £36,600 for 1908, as contrasted with £27,300 in the previous year on a share capital of £200,000, and a bond issue of £198,000. A dividend at the rate of 26s. per share has been declared on the fully paid priority shares, and 6s. per share on the ordinary shares.

The Russian General Electricity Co., which is associated with the A.E.G., of Berlin, and has a share capital of £600,000, states that the turnover increased normally during 1908, although Government orders were lacking, as in the previous years, and an active and regular working took place at the Riga works during the whole of the year. The gross profits amounted to £150,394, as compared with £126,784 in 1907, and the net profits, including the balance forward, were £67,523 and £51,147 in the two years respectively. A dividend at the rate of 6 per cent. has been declared, as contrasted with 4 per cent. in 1907. It is proposed to provide additional working capital by making a fresh issue of shares to the extent of £100,000. The directors add that the United Cable Works Co., in which the company is financially interested, intends to distribute 7 per cent., being the same rate as in 1907.

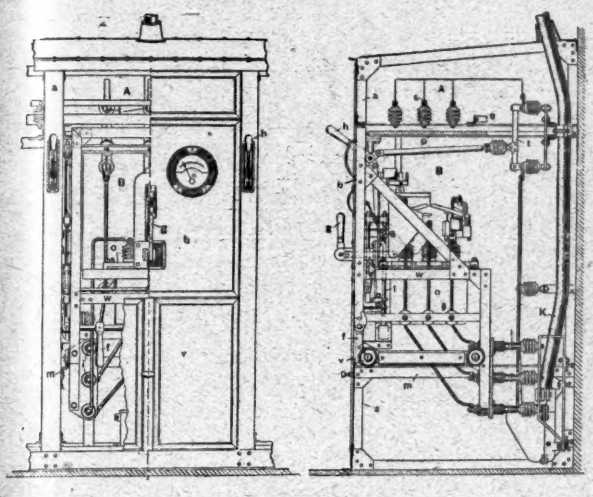
The Russian Siemens & Halske Co., of St. Petersburg, realised net profits amounting to £32,046 in 1908, as contrasted with £30,629 in the preceding year, when the share capital was reduced from £700,000 to £560,000. It is proposed to pay a dividend at the rate of 4 per cent., being the same as in 1907, and comparing with no distribution in 1906.

The United Cable Works Co., of St. Petersburg, which is the amalgamated cable manufacturing departments of the German companies in that city, earned a surplus on working of £57,545 in 1908, as compared with £41,510 in 1907. After placing £2,746 to the reserve fund and applying £14,114 to the redemption of capital, the balance has allowed of the payment of 7 per cent., as against a dividend of 5 per cent. in 1907.

HIGH-PRESSURE SWITCHBOARDS WITH REMOVABLE SWITCH CARRIAGES.

THE general adoption of high-pressure alternating current for the distribution of electrical energy has necessitated the evolution of switchgear, which shall be at the same time perfectly safe to handle whilst alive, and readily isolated when necessary for the purpose of repairing and cleaning the gear without risk and without interfering with the working of the system. Progress has advanced mainly in two directions—towards the adoption of remote-control switchgear on the one hand, and towards hand-operated cellular removable switchgear on the other, the whole of the high-pressure apparatus in the latter case being made capable of complete detachment from the switchboard in separate sections, which may also be interchangeable, so that a spare section may be kept at hand ready to replace any other when required. When the connections to these sections are made by hand, sufficient space must be provided behind the board so that the high-pressure plug contacts can be connected and inspected from time to time when the switch carriage is in position. It will be evident that these plug contacts form the most sensitive part of the switch-carriage construction, and great care must be taken to see that they always make good contact.

This arrangement cannot, however, be employed when the switchboard is to be installed in extremely limited spaces, as, for example, in mines, where the space necessary for the switchboard can only be gained by expensive excavations. It is, further, frequently necessary to erect the high-pressure gear immediately behind the control board. In this case all switches, measuring transformers, &c., are mounted close up against the wall, and are consequently quite inaccessible from behind. Considerable attention has been devoted by the Felten & Guilleaume Lahmeyerwerke A.-G., Frankfort-on-Main, to combining safety with ease of inspection in the design of switchboards of this type on the cellular system, and an interesting example of their switchgear, which is protected by several patents, is shown in the accompanying illustrations. Figs. 1 and 2 show the front view and section of a



Figs. 1 and 2.—Front View and Section of Cell, Showing Switch-Carriage, &c.

complete three-phase distribution switchboard of this type. Each cell consists of a strong angle-iron framework completely covered with sheet iron, which can be mounted directly up against the wall, and is divided into two chambers by means of a horizontal insulating partition *p*. The top chamber A contains the high-pressure bus-bars S, which are mounted on porcelain insulators, and the lower one B the actual switchgear. In addition to this, the lower chamber B of each cell is separated from the adjacent ones by means of vertical flame-proof partitions built up of incombustible stonework or insulating material. The jaws of the

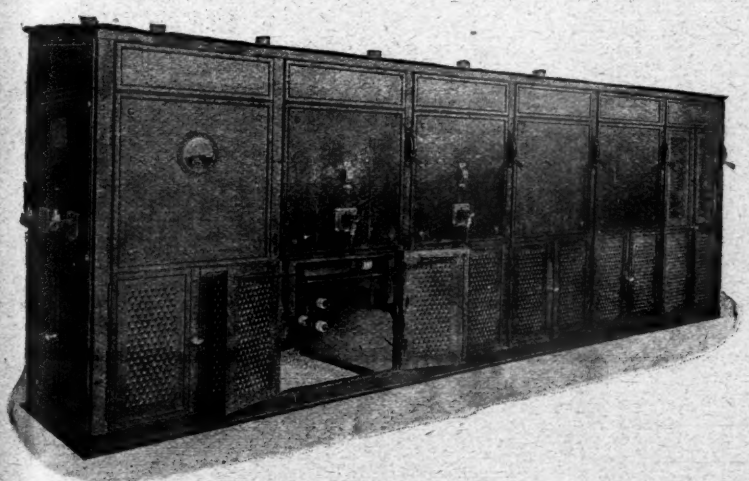


Fig. 3.—High-Pressure Switchboard, with Inspection Doors Open.

three-pole isolating switch *t*, mounted in the bus-bar chamber A, are in direct connection with the bus-bars, and their blades, which pass through slots in the insulating partition *p*, are provided with earthing contacts *e* at their lower ends. When one of the isolating switches is opened, all the apparatus carrying current which are contained in chamber B are completely isolated from the bus-bars, and all parts of the switchgear below the partition are in direct connection with earth. Consequently there is no possibility of danger from a residual charge when the panel is opened up for inspection. The isolating switch *t* is actuated through a system of rods connected to the lever *h*, which is fitted to the rigid part of the switchboard front.

The front of the top chamber A as well as the front of the top part of the chamber B is formed by a rigid covering of sheet iron, whilst folding doors *v* of ornamental sheet iron are fitted below that portion of the panel forming the front of the removable switch carriage.

The removable switch carriage *w* consists of a riveted angle-iron

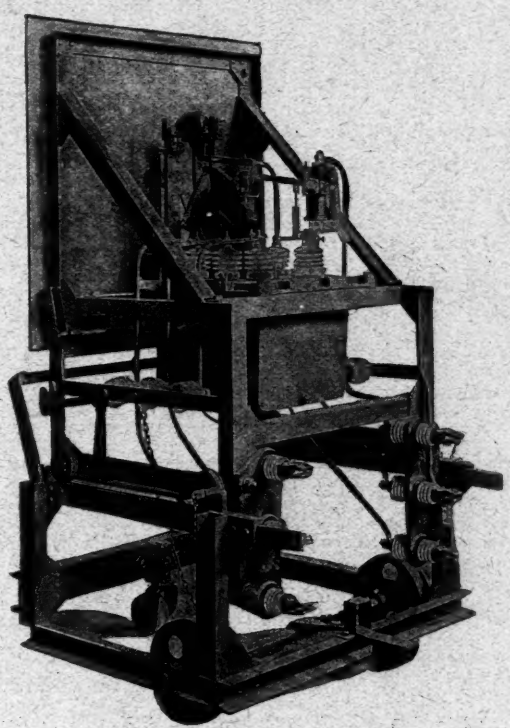


Fig. 4.—Switch-Carriage on Truck.

framework mounted on wheels, which run on the rails *m*. It carries the oil-break circuit switch *o*, together with the relays and other auxiliary apparatus, the hand lever *g* for operating the oil switch, and on the sheet-iron front mentioned above, the measuring instruments and signalling apparatus. The connection of this removable portion of the panel to the isolating switch *t* and the bus-bars S on the one side, and to the feeders K on the other side, is made by means of two sets of three-pole high-pressure plug-contacts *i*. These contacts are carried on the lower part of the switch carriage, into which fit the corresponding fixed contacts mounted at the back of the board. These fixed contacts are further fitted in such a manner that, after opening the doors *v* at the front of the switchboard, they are easily accessible to the attendant. This is an important point, as it is of great advantage that the contacts may be examined when the switch carriage is in position, to obviate the possibility of their becoming displaced, and to ensure their making good contact. The switch carriage is withdrawn from the switchboard by means of a truck provided for the purpose. After the folding doors *v* have been opened, this truck is wheeled right up in front of the switch carriage, and is fastened in place by means of a catch. The switch carriage may then be withdrawn from the switchboard for the purpose of testing or adjusting, and can, after loosening the catch holding the same, be completely removed from the switchboard. In order to prevent jolting whilst removing and replacing the plug-contacts, the necessary horizontal motion of the switch carriage is effected by the claw-shaped handle *f* by means of an arrangement of levers, while the other motion takes place directly. The company have further, by interlocking all the gear, provided a system in which all the necessary operations can only take place in a definite way without danger. The lever *h* of the isolating switch is, in its "on" position, interlocked with the lower inspection doors *v* by means of the vertical rods *l* and with the switch carriage, in such a manner that the former cannot be opened, nor the switch carriage withdrawn, as long as the plug contacts and main switch are under pressure. In like manner the isolating switch cannot be closed while the doors *v* are open or the switch-carriage is withdrawn. The isolating switch is further interlocked with the handle *g* of the main oil switch, so that the former can be opened or closed only when the latter is open, and there is thus no possibility of the isolating switch being opened while carrying current. In this way, the opening of the doors *v* and, therefore, access to

the interior of the switch carriage and the withdrawal of the same can only be effected after the main oil switch, and then the three-pole isolating switch, have been opened, and by this means the whole switch carriage earthed and made dead. On the other hand, the isolating switch can only be closed again, and the switch carriage put under pressure, after it has been replaced and both parts of the folding doors v closed. All eventualities are thus provided for, and contact with any bare metal carrying current is absolutely impossible.

The switchboard attendant is therefore only able to undertake all the manipulations necessary for opening, withdrawing, or replacing the switch carriage in definite order, and accidents or mistakes on his part cannot possibly occur. The interlocking is in all cases accomplished by means of simple but effective catches, operated either directly by the respective switch handles or by their own weight. The use of springs of every description has been avoided in the interlocking gear, owing to their liability to rust and stick, thus becoming deranged and seriously affecting the security of the service.

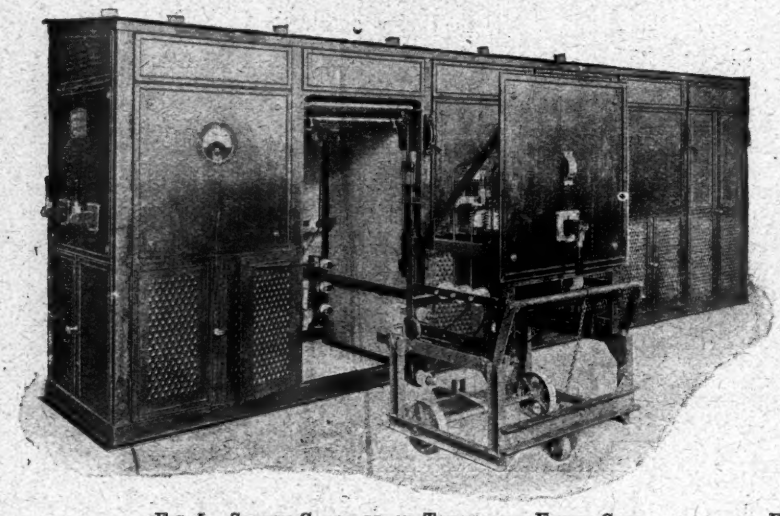


FIG. 5.—SWITCH-CARRIAGE ON TRUCK, AND EMPTY CELL.

The outgoing cable K is, in accordance with the system of wiring generally used in mines, led in at the top of the switchboard and connected directly to one set of plug contacts in the chamber B. The outgoing and incoming single rubber-covered cables are also led in and out from above, thus making easy and economical erection possible. If desired, however, the cable can be led in at the bottom of the switchboard. Where two or more feeders supply current to a sub-station, or where the switchboard is connected to a network or ring main, there is, however, always a possibility that the cable will still remain under pressure, even though the main switch has been cut out. In this case the ends of the cable are taken to the top chamber A, and connected to the plug contacts *i* through isolating blades, which are fitted in exactly the same manner as the blades E. These isolating switches are then mechanically coupled together, and form a six-pole isolating switch, which is simultaneously operated by a single lever. By this means perfect safety is ensured, and no dangerous pressures can exist in the switch carriage when cut out of circuit. Figs. 3 and 5 show a 5,000-volt switchboard of the type described, which is installed underground in the Franziska Pit, Gelsenkirchen, Westphalia.

Fig. 3 shows the switchboard complete, with the lower doors open to give access to the high-pressure plug contacts of a switch carriage after it has been cut out of circuit; fig. 5 shows the truck carrying the switch carriage, and the accessible empty cell, and fig. 4 shows a switch carriage containing the high-pressure automatic circuit-breaker resting upon its truck after removal from the switchboard.

The switch carriage is also specially adapted for receiving other apparatus, such as arresters, together with resistances and similar apparatus, as, for example, in the installation shown in fig. 6. The above-mentioned construction, *i.e.*, with removable switch carriages, is suitable for building up switchboards for generating plants and complete central station installations, although with these the main advantages of the system, namely, the small floor space necessary and complete operation from the front of the board, are not of such consequence as with distributing boards where this is mostly the case.

For the erection and attendance of an installation of this description a maximum width of 8 ft., of which 4½ ft. is for the passage-way in front of the switchboard, completely suffices, as the depth of a normal switch-carriage frame intended for a pressure of 5,000 volts is practically 4 ft., and that of the removable switch carriage itself only about 3½ ft.

High-pressure switchboard installations of the cellular type, for pressures up to 10,000 volts, have been constructed in large numbers by the F.G.L. for electricity works and textile factories, of which several have been in service uninterruptedly for many years.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Guardian Pendant Lampholder.

MESSRS. WARD & GOLDSTONE, of Springfield Lane, Salford, have sent us particulars of their new Guardian patent pendant lamp-holder, of which we give an illustration herewith. This device was described in our last issue, and, as there stated, has been designed to obviate the necessity of using an earth wire. As the figure shows, the flexible cord coming away from the holder passes through a rubber grip before going out of the case, and the lampholder itself is completely covered with wood.

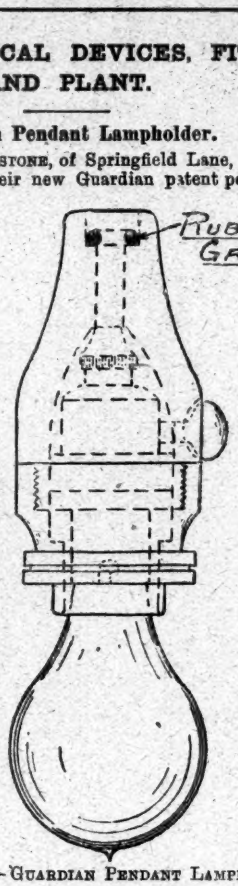


FIG. 1.—GUARDIAN PENDANT LAMPHOLDER.

"Metfil" Metallic-Filament Lamps.

The original inventors and patentees of the incandescent electric lamp, the EDISON & SWAN UNITED ELECTRIC LIGHT CO., LTD., of 36 and 37, Queen Street, E.C., have placed on the market a very complete and extensive range of their new British-made metallic-filament lamps, made at their Ponder's End Works, Middlesex, under the name of the "Royal Ediswan Metfil." The company exhibited lamps of this type of their own make at the Franco-British Exhibition, where they obtained the Grand Prix, the highest possible award, for lamps, &c. At the Manchester Exhibition also, Ediswan lamps of this type were on view. Since then the firm have carried on the manufacture and sale of metallic-filament lamps, whilst at the same time they have been engaged in constant experiment in order to ensure that the new "Metfil" lamps should be made with the same care, accuracy, and high finish that has characterised the firm's carbon-filament lamps.

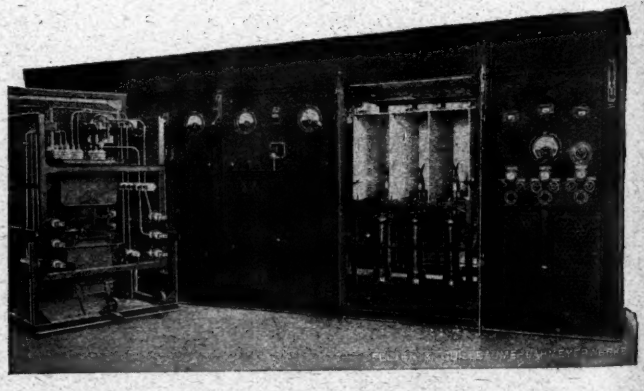


FIG 6.—CELL OPEN, SHOWING LIGHTNING ARRESTERS WITH RESISTANCES.

Whilst the efficiency of the Royal Ediswan "Metfil" lamp may be taken as being as high as that of any other metallic-filament lamp on the market, the useful life is not less than 1,000 hours. The lamps do not blacken with use; many lamps that have burned

for three or four times the normal life show no traces of discoloration. In addition, it is claimed that the filaments are tough, and not brittle—a characteristic probably due to the special process by which they are made—and will withstand ordinary usage, a matter of considerable importance to both user and electrical contractor. A further point in connection with the ordinary pattern "Metfil" lamps is that they can be placed in shades of the same size as were previously used for lamps of the carbon type, the bulbs of the standard lamps being of the same shape and appearance as those of their carbon prototypes, as shown in fig. 2.

The filaments are effectively supported throughout their

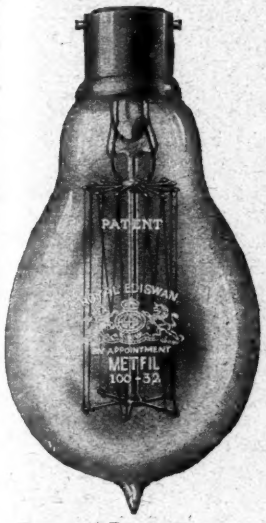


FIG. 2.—"ROYAL EDISWAN METFIL" LAMP.

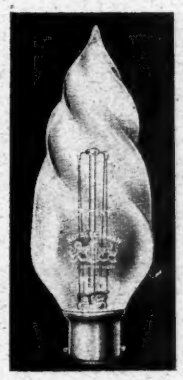


FIG. 3.—"METFIL" CANDLE LAMP.

length; the lamps can thus be used in any position, even upside down if necessary, as in fig. 3, without fear of the filament breaking or sagging unduly.

The firm have been successful in producing a high-voltage metallic-filament lamp, made in several different candle-powers, suitable for use on circuits of from 200 to 250 volts. A number of varieties of candle, flame, and special-shaped bulb lamps are also listed in the new catalogue, which is issued by the firm, and which contains a very comprehensive range of metal lamps. The "Metfil" lamp is made for practically every required candle-power and voltage, ranging from small miniature lamps for use with batteries, to the lamps of somewhat higher voltage used in conjunction with Ediswan auto-transformers, and so on through the 100 and 200-volt ranges.

The "Metfil" lamps are graded and marked in British candle-power; this is important, in view of the fact that many metallic-filament lamps are marked in hefners, a light unit of 10 per cent. less intensity than the British standard candle.

Large Chain Drives.

THE WESTINGHOUSE BRAKE CO., LTD., of King's Cross, London, N., inform us that they have just received a repeat order for four more of the exceptionally large chain drives described in our

FIG. 4.—WESTINGHOUSE CHAIN DRIVES.

columns about a year ago. Details of the drives supplied by the Westinghouse Brake Co., Ltd., to this one firm (the Kolomna Engine and Machine Works, of Russia) are as follows:—

Number of drives	7	Width of wheels	23 in.
Horse-power of each drive	500	Pitch of chain	2 ,,
Aggregate horse-power	3,500	Width of each chain	10 ,,
Outside diameter of wheels	37,784 in.	Chain speed	1,480 f.p.m.

Each drive consists of two 250-H.P. chains, running on one pair of wheels.

The great range of sizes covered by the Westinghouse Brake Co., Ltd., in the manufacture of chain drives is shown by fig. 4, which depicts a 0·3-H.P. drive inside the bore of the large wheel of a 300-H.P. drive. The latter was supplied to the well-known "Kodak" photographic supplies manufacturers' Jamestown works, to drive an air compressor from a Corliss engine.

Mining Switch and Fuse Panels.

We illustrate herewith a new type of switch and fuse panel, which has recently been put on the market by MESSRS. A. REYROLLE AND CO., LTD., Hebburn-on-Tyne, and which displays Messrs. Reyrolle's usual solidity in construction combined with careful attention to convenience and safety. The particular fuse-box illustrated is not intended to be flame-proof, but the firm can, if necessary, supply fuse-boxes with wide machined joints, which render the emission of flame impossible, even should an explosion take place inside the box. The fuses are of the firm's well-known ventilated type, and the oil-switch is non-automatic, but is fitted with a particularly quick break. The handle of the oil switch and

FIG. 5.—REYROLLE MINING SWITCHGEAR.

the door of the fuse box are interlocked in such a way that the latter can be opened only when the switch is in the "off" position; and while the fuse box is open, it is impossible to close the switch.

The quadrant attachment shown on the lid of the distribution box has a slot running its whole length, and forming part of a circle, of which the hinge of the lid is the centre, the radius of the circle being the distance between the hinge and a pin on the oil switch handle, when the latter is in the "off" position. This pin has a certain amount of circular movement, and as it is only in the "off" position of the handle that the position of the pin coincides with the radius of the slot in the quadrant, it is obvious that the two parts, namely, the lid and the handle, cannot work independently of each other.

"Primus" Oil Engine.

MR. E. ATKINSON SMITH, of 70, Victoria Street, S.W., has sent us particulars of the "Primus" paraffin and crude-oil engine, made by Karl Heineman, of Gothenburg, Sweden, for which he is the agent in the United Kingdom. It is claimed that the efficiency of this engine is very high, while it has only three moving parts. The consumption of crude oil, costing 50s. per ton at present, is stated to be only 0·56 lb. per B.H.P.-hour. The engine is of the two-cycle type, and therefore has an impulse every revolution with a single cylinder. Ignition is effected, after the engine is started, by the heat of a bulb on the cylinder head, against which the oil is sprayed by a small pump, the explosions keeping the bulb hot enough for this purpose. Control is effected by varying the stroke of the pump, by hand or by means of a fly-wheel governor. The engine is made in sizes from 5 to 25 B.H.P. with single cylinder. Mr. Smith is agent also for the Pierson 4-H.P. suction gas plant for country-house installations, the engine being of the vertical type.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

ECUADOR (*concluded*).

100 centavos = 1 sucre = 2s.

The following goods are free of duty:—Iron frames, beams, columns for construction purposes; coal; cement for building purposes; railway material of all kinds; machinery in general, with spare parts for same, and boilers; iron or steel bridges; iron or steel posts; rails; tiles and tubes of earthenware; lightning conductors; also, with special permit, articles strictly necessary for municipalities for lighting and other public works.

The following pay 1 centavo per kg. gross:—Tubes of china or clay, glazed; pig-iron; resin.

The following pay 2 centavos per kg. gross:—Sulphuric acid; mechanical pumps for water; iron or lead piping not otherwise mentioned; iron or steel in bars, sheets, hoops, flat, half-round, angle or T-shaped; machine grease; paraffin; lead in bars, ingots, sheets and scrap lead; apparatus and materials for electric lights and other electrical apparatus, except chandeliers; refined tallow.

The following pay 3 centavos per kg. gross:—Iron sheets and iron gutters or ridging, corrugated; tin plate, plain, in sheets, zinc in plain sheets or in the rough.

The following pay a duty of 5 centavos per kg. gross:—Machine oil; hydrochloric, rectified phenic, nitric, boric and carbonic acids; elevators; pitch and tar; brass, copper, tin and bronze in bars or unperforated sheets; calcium carbide; bells; wire rope and cable; marble, polished; ordinary glass or crystal ware; crude petroleum.

The following pay a duty of 10 centavos per kg. gross:—Fine crystal ware; india-rubber, manufactured; porcelain articles not otherwise specified.

The following pay a duty of 20 centavos per kg. gross:—Machine belting.

The following pay a duty of 20 centavos per kg. net:—Articles made of steel, iron, tinplate, tin, bronze, copper, brass, nickel, lead, zinc, except those elsewhere specified.

The following pay a duty of 25 centavos per kg. gross:—Apparatus for telegraphs and telephones; chandeliers and candelabra of all kinds.

The following pay a duty of 25 centavos per kg. net:—Machine packing; lanterns; spirit levels.

The following pay a duty of 30 centavos per kg. net:—Oil cans; articles made of rubber, not elsewhere specified; manometers.

The following pay a duty of 40 centavos per kg. net:—Mathematical and other scientific instruments.

The following pay a duty of 60 centavos per kg. gross:—Lamp shades of paper, cardboard or woven material.

Other goods not separately mentioned in the Tariff pay a duty of 30 centavos per kg.

Surcharges amounting to 100 per cent. of the amounts of duties payable are leviable on all goods.

The following wharf dues are also payable:—Articles exempt from import duty, baggage, and all other duty free articles transported on the deck of the vessel without bill of lading, 2 sucres per 100 kg.

Ships, put together, or not, and machinery for the same; small craft; railways and railway materials; machinery, spare parts for the same, and boilers; iron bridges and materials for the same:—If discharged on wharf, 2 sucres per ton; if not so discharged, 1 sucre per ton.

Porterage dues of 2·20 sucres per ton are also levied on imported goods.

NEW PATENTS APPLIED FOR, 1909.

Compiled expressly for this journal by W. P. THOMPSON & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

15,006. "Improved terminals for shunts and other electrical apparatus." KELVIN & JAMES WHITE, LTD., W. T. EVANS and S. B. WILSON. June 28th. (Complete.)

15,081. "Improvements in and relating to electric dynamos and motors." H. B. VAN DAALEN. June 28th.

15,086. "Improvements in apparatus for automatically establishing and cutting off the supply of electricity, gas, or other fluid." J. HANSFORD and J. F. WRIGHT. June 28th.

15,115. "Improvements in and relating to electric reflector lamps." C. C. REGNART. June 28th. (Complete.)

15,147. "Improvements in trolley heads of electric tramcars." E. H. COCKSHOTT. June 29th.

15,151. "Improved contact-finger for electrical controllers, switches and the like." R. C. LYNESS. June 29th.

15,158. "New or improved method of eliminating or reducing electrostatic electromagnetic induction between contact wires of electric traction systems and adjacent telegraph and telephone circuits." J. SAYERS. June 29th.

15,167. "Improvements in telegraphy." L. M. POTTS. June 29th. (Complete.

15,182. "Improvements in and relating to flame arc lamps." F. SMITH and F. V. SMITH. June 29th.

15,192. "Improvements in the manufacture of metallic filaments for incandescent electric lamps." SOCIETE FRANCAISE D'INCANDESCENCE PAR LE GAZ (SYSTEME AUER.) (Date applied for under Sec. 91 of the Act, July 18th, 1908, being date of application in France.) July 29th. (Complete.)

15,193. "Improvements in the preparation of filaments suitable for incandescent electric lamps." SOCIETE FRANCAISE D'INCANDESCENCE PAR LE GAZ (SYSTEME AUER). (Date applied for under Sec. 91 of the Act, July 18th, 1908, being date of application in France.) June 29th. (Complete.)

15,194. "Improvements in primary batteries." W. A. F. BLEECK. June 29th. (Complete.)

15,208. "Improvements in and relating to the actuation of controllers and the like for electric machinery." H. B. VAN DAALEN. June 29th. (Complete.)

15,208. "Improvements in reflectors or shades for electric lamps." L. ZAMBONI and C. A. STERLING. June 29th. (Complete.)

15,210. "Improved method for attaching the filaments of incandescent lamps." J. CANELLO. (Date applied for under Sec. 91 of the Act, July 22nd, 1908, being date of application in France.) June 29th. (Complete.)

15,211. "Improvements in electric switches." W. H. FLOOD. June 29th.

15,217. "Improvements in brush-holders for dynamo-electric machines." J. S. HIGHFIELD. June 29th.

15,251. "Improvements relating to sparking plugs." F. B. LODGE and A. M. LODGE (trading as Lodge Bros. & Co.). June 30th.

15,282. "Improvements in or relating to driving mechanism for petrol-electric apparatus." FELTEN & GUILLEAUME LAHMEYER-WERKE AKT.-GES. (Date applied for under Sec. 91 of the Act, July 1st, 1908, being date of application in Germany.) June 30th. (Complete.)

15,287. "Improvements in magazine electric arc lamps." JOHNSON AND PHILLIPS, LTD., and J. BROCKIE. June 30th.

15,298. "Improved electric shunt arrangement for watt measurement." C. E. J. O'KEENAN. (Date applied for under Sec. 91 of the Act, July 17th, 1908, being date of application in France.) June 30th. (Complete.)

15,317. "Improved electric motor." C. H. PRÖTT. June 30th. (Complete.)

15,319. "Improvements relating to dynamo-electric machines constructed with commutators." R. POHL and THE PHOENIX DYNAMO MANUFACTURING CO., LTD. June 30th.

15,323. "Means for diminishing the field excitation of variable speed electric generators in proportion to their speed of rotation." H. LEITNER. June 30th.

15,326. "Improvements in the production of constant potential electric circuits." H. LEITNER. June 30th.

15,342. "Improvements in or appertaining to electric terminals or binding screws." G. W. MICKLETHWAIT. July 1st.

15,345. "Improvements in voltage regulators for dynamo-electric machines." T. FERGUSON. July 1st.

15,351. "Incandescent electric lamp filament packing or transit box." F. HARRISON. July 1st.

15,370. "Improvements in and relating to radiators." L. HODGSON. July 1st.

15,371. "Improvements in collector shoes or skates for electric traction systems." R. J. HOUGHTON, P. ALLMAN and W. T. GRAY. (Date applied for under Rule 13, June 2nd, 1909. An invention comprised in application No. 12,937, dated June 2nd, 1909.) July 1st.

15,380. "Improvements in or connected with high-tension magneto-electric machines." F. R. SIMMS and SIMMS MANUFACTURING CO., LTD. July 1st.

15,381. "Improvements in or connected with magneto-electric machines." F. R. SIMMS and SIMMS MANUFACTURING CO., LTD. July 1st.

15,385. "Improvements in or relating to electric telegraphy." S. G. BROWN. July 1st.

15,389. "Improvements in electric ignition apparatus for internal combustion engines." L. A. HINDLEY, H. D. HINDLEY and W. STANFORD. July 1st.

15,418. "Improvements in and relating to the jointing of electrical conductors." C. VERNIER. July 1st. (Complete.)

15,421. "Improvements in and relating to current collecting devices for dynamo-electric machines." BRITISH THOMSON-HOUSTON CO., LTD., and W. F. DAWSON. July 1st.

15,438. "Improvements in electricity meters." G. HOOKHAM. July 2nd.

15,441. "Improved construction of quick make and break electrical switch." VERITY, LTD., and W. G. PIPKIN. July 2nd.

15,444. "Adapter for converting oil or similar lamps for use with electric light." H. R. RIVERS-MOORE. July 2nd.

15,475. "Improvements in electrically-operated apparatus for locking railway carriage and other doors." R. B. NELSON, J. ORMSBY and E. NICHOLSON. July 2nd. (Complete.)

15,494. "Improvements in rotary electric transformers and motor generators." CROMPTON & CO., LTD., J. C. MACFARLANE and H. BURGE. July 2nd.

15,496. "Process for the manufacture of metallic-filaments for electric incandescent lamps." R. JAHODA. (Date applied for under Sec. 91 of the Act, May 10th, 1909, being date of application in Austria.) July 2nd. (Complete.)

15,554. "Improvements in magazine electric arc lamps." C. F. TUBBS. July 3rd.

15,572. "Safety devices for electric annunciators." A. G. M. CATHIARD. July 3rd.

15,574. "Improvements relating to overhead lines for electric traction." C. M. E. PRIESTLEY. July 3rd. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. THOMPSON & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1908.

STARTING OF POLYPHASE MOTORS. Akt.-Ges. Brown, Boveri & Cie. 20,827. October 2nd. (Date applied for under International Convention, October 3rd, 1907.)

METHOD OF PRODUCING HOT WATER BY MEANS OF ELECTRICITY AND APPARATUS THEREFOR. G. G. Bell and J. St. V. Pletts. 22,598. October 24th.

METHOD FOR COUPLING DYNAMOS AND ELECTRIC MOTORS. A. H. Zumsteg and R. E. Zumsteg. 23,800. November 6th.

CONTROL OF RAILWAY TRAFFIC BY MEANS OF THE BLOCK TELEGRAPH SYSTEM OF SIGNALLING. W. R. Sykes and C. J. Cooke. 24,080. November 10th.

METAL-FILAMENT ELECTRIC GLOW LAMP. H. Kuzel. 25,044. November 20th. (Date applied for under International Convention, May 14th, 1908.)

SINGLE-PHASE ALTERNATING-CURRENT ELECTRIC MOTORS OF THE COMMUTATOR TYPE. E. F. W. Alexanderson. 28,189. December 24th. (Date applied for under International Convention, December 26th, 1907.)

WIRELESS TELEPHONY AND TELEGRAPHY. A. W. Sharman. 12,140. June 4th.

SUPPORTING AND INSULATING MEANS FOR AERIAL AND OTHER ELECTRICAL CONDUCTORS. G. W. Partridge and P. Dawson. 5,781. March 14th.

SPEED REGULATION OF INDUCTION MOTORS. M. Stern. 12,826. June 6th. (Date applied for under International Convention, June 12th, 1907.)

CONTROL OF ELECTRIC MOTORS. H. A. Mavor and Mavor & Coulson, Ltd. 12,498. June 10th.

PLUG OR HOLDFAST FOR USE IN FIXING GAS FIXTURES, TELEPHONES, MANTELS, SHELVES, BOLT ENDS, STANCHIONS, AND ALL SUCH LIKE ARTICLES THAT REQUIRE FIXING TO WITHSTAND STRAINS. J. Taylor. 12,519. June 11th.

ARC LAMPS. D. Timar and C. von Dreger. 12,656. June 12th. (Date applied for under International Convention, July 8th, 1907.)

MANUFACTURE OF INCANDESCENT ELECTRIC LAMP FILAMENTS AND APPARATUS THEREFOR. Soc. Francais d'Incandescence par le Gaz (Système Auer). 12,720. June 13th. (Date applied for under International Convention, July 13th, 1907.)

ELECTRIC TELEGRAPHY. J. A. L. Dearlove. 13,191. June 20th.

DYNAMO-ELECTRIC MACHINES. A. A. Pifer and E. F. Ahlm. 13,748. June 29th.

SECTIONAL INTERRUPTERS FOR THE LINE WIRES OF ELECTRIC RAILWAYS. Albert Thode & Co. 14,366. July 6th. (Date applied for under International Convention, July 9th, 1907.)

CURRENT COLLECTOR FOR USE IN ELECTRIC TRACTION SYSTEMS. A. West. 14,695. July 10th.

METHOD OF AND APPARATUS FOR AUTOMATICALLY IGNITING AND EXTINGUISHING ELECTRIC AND OTHER LAMPS BY THE ACTION OF THE SUN'S RAYS. Sir H. Norman and T. B. Reader. 17,540. August 21st.

METHOD OF AND APPARATUS FOR MAKING ELECTRIC CONNECTIONS AT A DISTANCE AT SEA BY MEANS OF ELASTIC IMPULSES OR WAVES TRANSMITTED THROUGH THE WATER. Klupathy and Berger. 18,025.

ELECTRIC FURNACE FOR THE CONTINUOUS EXTRACTION OF ZINC FROM ITS ORES. E. F. Cote & P. R. Pierron. 18,653. September 5th. (Date applied for under International Convention, February 12th, 1908. Application for patent of addition to No. 5,100/07.)

TELEPHONE INSTRUMENTS. W. Aitken. 19,457. September 16th.

ELECTRICAL PROPULSION OF SHIPS. Siemens Bros. Dynamo Works and C. A. B. D. Koettgen. 21,152. October 7th.

SPEED REGULATION OF ELECTRICALLY DRIVEN RING SPINNING FRAMES. Akt. Ges. Brown, Boveri et Cie. 22,349. October 21st. (Date applied for under International Convention, May 27th, 1908.)

ELECTRICAL INDUCTION CLUTCHES. A. P. Steckel. 28,180. December 24th.